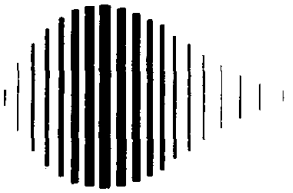

NATIONAL CENTER FOR EARTHQUAKE ENGINEERING RESEARCH

State University of New York at Buffalo

Proceedings from the Implementation of Earthquake Planning and Education in Schools: The Need for Change - The Roles of the Changemakers

Edited by

K. Ross and F. Winslow

National Center for Earthquake Engineering Research
State University of New York at Buffalo
Red Jacket Quadrangle
Buffalo, New York 14261

Technical Report NCEER-91-0022

July 23, 1991

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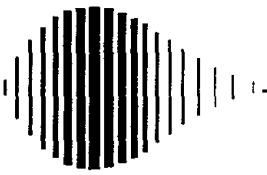

Proceedings from the Implementation of Earthquake Planning and Education in Schools: The Need for Change - The Roles of the Changemakers

Irvine, California
May 16-17, 1990

Technical Report NCEER-91-0022

Edited by: K. Ross[1] and F. Winslow[2]

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Introduction

Building a Workshop: Building a Plan
by *Frances E. Winslow*

Building a Workshop: Building a Plan

Frances E. Winslow, Ph.D.
Emergency Management Coordinator
City of Irvine

Are Schools "Aware" or "Prepared?"

How prepared are schools to cope with earthquake effects? In areas of the United States where earthquakes are likely to occur, school officials, parents and public safety officials work to create safe environments for the students during the school day. However, preparedness planners may not have access to information that they need. People with various skills may each be working on discrete areas rather than working conjointly in a team environment. Students may not receive much information about earthquakes: causes, effects and results.

Throughout the United States, earthquake awareness seminars have been held for community leaders, including school officials. Often these seminars have focused on "the problem," without offering many opportunities for exploring possible solutions. Many times schools are represented by one key individual, or by district-level leaders.

When it was decided to hold regional seminars on earthquake planning for schools, NCEER staff worked with local emergency planners to create a different format. This time the emphasis would be on the need for a comprehensive program of planning that would integrate the skills of the school faculty and staff, and the effected community. The workshop was designed to foster the team approach through increasing the awareness of the value of the distinctive contributions expected from each team member.

Accurate Information: The First Step

Although there is a general knowledge of earthquakes, there are also many misconceptions regarding aspects such as the causes and effects of tectonic plate movement, appropriate behavior during an earthquake, and the efficacy of mitigation measures taken beforehand. Earthquake preparedness educators cannot safely assume that just because people live in an earthquake-prone area they have all the information that they need to plan adequately for earthquake effects in schools. Everyone needs a starting point for the development of a plan. An accurate analysis of the actual risks to the community must be the basis for all school earthquake planning.

An essential aspect of the workshop was the development of a body of common knowledge that is needed by everyone before a rational earthquake plan can be developed. The workshop started by providing a grounding in accurate, scientific information about the effects of earthquakes on the built environment. Information was provided on the relationship between schools and their local governments, and between schools and community and voluntary organizations.

Building a Plan: Building a Team

The second focus of the workshop was the development of the team approach for earthquake preparedness planning. Often in the past, development of the earthquake plan was seen as a discrete activity of a single administrator, who created the plan alone. This workshop sought to identify the various players who should be a part of the development of a workable plan.

The principal has the overall responsibility for the development of the plan for the school site. The nurse understands the need for triage, first aid, advanced medical treatment, and possible coroner operations at the school site after a disaster. The science teacher understands the geological aspects of earthquake effects and their effect on the built environment. He or she may be able to provide curricular followthrough and assist with evaluation of building safety. The Parent Teacher Association members include many professionals in a variety of fields that might prove a resource to the planning team. Parents may include medical personnel, construction workers, and psychologists, whose professional skills could be used to evaluate and enhance plans. The PTA is also often a source of funding for supplies not available through the annual school district-provided budget. Unfortunately, these groups of specialized professionals may not meet together in ordinary earthquake response planning environments. How often do PTA members have a chance to discuss emergency planning issues with the school nurse, for example?

Through the medium of the conference, participants developed an appreciation for the contribution of each member of the identified school team. The team had the opportunity to develop specialized aspects of the plan as independent modules, then review and revise those modules in light of the total team experience. The workshop was designed to be more than an awareness session: it became an enabling environment where the planning process itself could be developed, explained and expanded. Interactive learning among participants from a variety of schools enriched the body of knowledge.

Curriculum: Making the Children Part of the Plan

Good school plan making is not enough. Earthquake education for children must be thoroughly integrated into all aspects of the school curriculum. The health curriculum should impart information on life-saving behaviors during an earthquake, safe behavior following an earthquake, and anticipated psychological manifestations following the experience of being a victim of an earthquake. Information can be expanded to include triage, first aid, and search and rescue techniques for older students, as well. Science curricula should include plate tectonics, engineering-related effects in the built environment, and appropriate preparedness activities. All of this material must be presented as relevant to daily life, and reinforced through articles assigned in reading, essays required for creative writing, and word problems used in mathematics. The reality of earthquakes must become as accepted and psychologically non-threatening for students as the reality of winter storms and traffic accidents.

This workshop was designed to address an expressed need to tie together earthquake planning and curriculum materials for schools. In the workshop environment, guidelines were shared with all team members and curriculum materials were introduced.

Planning Together: The Team at School

If this format is used in other areas, it will be important to emphasize that plan-making will not occur during the context of the workshop segments. The goal of the conference was to provide materials and information that would enable the team from each school to develop appropriate, unique approaches to earthquake preparedness and student education. Workshop staff provided general guidance on dealing with issues and activities that were common to all schools. Each school team then customized that information in order to best accommodate their school community.

Part I

Overview

1-1 Program
1-2 Keynote Address

Implementation of Earthquake Planning and Education in Schools: The Need for Change - The Roles of the Change Makers

MAY 16-17, 1990

MORNING SPEAKERS
9:00 - 9:45AM
Catalina I & II

WELCOME
Frances E. Winslow, Ph.D.
Emergency Management Coordinator
City of Irvine

KEYNOTE SPEAKER
EARTHQUAKE INDUCED BUILDING DAMAGE: A CONTINUING PROBLEM
Robin Shepherd, Ph.D.
Professor, Civil Engineering
University of California, Irvine

BREAK
9:45 - 10:00 AM

SAFETY & PREPAREDNESS IN THE SCHOOL: AN OVERVIEW
10:00 - 11:50 AM

WHY PLAN?
Robert Peterson, Ph.D.
Orange County Superintendent of Schools
Orange County Department of Education
Frances E. Winslow, Ph.D.
Emergency Management Coordinator
City of Irvine

THE EARTHQUAKE THREAT TO ORANGE COUNTY
David R. Hill
Police Officer
City of Orange

EVALUATING OTHER HAZARDS IN YOUR AREA
Robert G. Berg
Emergency Service Coordinator
City of Anaheim

NON-STRUCTURAL HAZARD MITIGATION FOR SCHOOLS
Frances E. Winslow, Ph.D.
Emergency Management Coordinator
City of Irvine

AMERICAN RED CROSS & SCHOOLS:
PARTNERS IN PREPAREDNESS AND RESPONSE
Gordon Brown
Disaster Emergency Coordinator
Orange County Chapter
American Red Cross

WORKING WITH YOUR CITY
Jack Slota
Assistant City Manager
City of Placentia
Frances E. Winslow, Ph.D.
Emergency Management Coordinator
City of Irvine

THE TEAM CONCEPT/THE BUDDY SYSTEM
11:50 AM - 12:15 PM
Gloria Morrison
Emergency Services Coordinator
City of Huntington Beach

LUNCH
12:15 - 1:30 PM
Catalina III

AFTERNOON SESSIONS
TEAM PLAYERS: DEFINING YOUR ROLES
1:30 - 5:00 PM

PRINCIPALS
Marilyn Boyd, Group Leader
Prinicipal, Stone Creek Elementary School, Irvine
Communications Issues
Student/Safety/Security
Student Release Policy
Parent Relations
Media Relations
Earthquake Drills

SCHOOL NURSES
Sally Snyder, Group Leader
Head Nurse, Unified School District
Reducing Hazards in the School Environment
Supplies for Medical Response
Team Training for Medical Response
Caring for the Disabled/Special Needs Children
Caring for Children's Psychological Needs
Earthquake Drills

SCIENCE COORDINATORS
Ed Rodevich, Group Leader
Science Coordinator, Orange County Department of Education
Earthquake Hazards Curricula
Ensuring Laboratory Safety
Establishing Student Response Clubs
Considering Ethnicity in Earthquake Response

PTA LEADERS
Gloria Morrison, Group Leader
Emergency Services Coordinator
Huntington Beach
Parents and Pre-Planning
Understanding the Roles of School Staff in a Disaster
Student Release Policy
Parental Assistance to the School
Home Preparedness and Planning
Caring for Childrens' Psychological Needs
How to Raise Funds for Supplies

EVENING RECEPTION
5:00 - 6:30 PM
Wine and Cheese Reception
Catalina II & III

Vendor Display
Simpler Life Emergency Provisions
Extend-A-Life, Inc.
Promotion Ltd.
Sears Industrial Sales
Emergency Lifeline
CEPP Corporation
Mobile Mini
Brea Stationers
Lafferty Associates, Inc.

DINE AROUND
Information in Packet

THURSDAY MORNING
9:00 AM - Noon

COMING TOGETHER AS A TEAM:
ORGANIZE YOUR PLAN
Workshops will be held with a small group of school representatives and a faculty member. A plan format is included in your packet for your guidance as you develop a unique plan for your school.

BREAK
10:15 - 10:30 AM

LUNCH
Noon - 1:30 PM

NEXT STEP: ACTION!
1:30 - 2:30 PM
Joyce B. Bagwell, Director
Earthquake Education Center
Charleston Southern University, Charleston, South Carolina

2:30 - 3:00 PM
Workshop Wrap-Up and Door Prize Drawing

Summary of events and door prize drawing.
You must be present to win.

PLANNING COMMITTEE
Ferne Halgren, Quake Safe, UCLA Extension
Katharyn E.K. Ross, National Center for Earthquake Engineering Research
Frances E. Winslow, City of Irvine

LOGISTICS
Dawna Finley, City of Irvine, Chairman
Becky Eddy, City of Irvine

REGISTRATION
Becky Eddy, City of Irvine, Chairman

Keynote Address: Earthquake Induced Building Damage: A Continuing Problem[1]

Robin Shepherd, Ph.D.
Professor of Civil Engineering
University of California at Irvine

In many places, violent movements of the earth's crust have provided one of the major natural hazards for as long as mankind has attempted to undertake any form of construction. Undoubtedly, losses from some natural phenomena such as floods and typhoons continue to exceed those arising from earthquakes. But whereas the destructive effects of some other natural phenomena have been reduced relatively successfully over the centuries, seismic shaking continues to pose a major threat of catastrophic damage of an apparently unpredictable nature to the extent that the failure to overcome the problem may call into questions the competence of those scientists and engineers involved in earthquake response mitigation. Nowhere is this more evident than in Latin America. A long history of seismic shaking, coupled with varying levels of success by successive civilizations in coping with the situation, has produced no better result than unexpectedly high casualties and property losses in recent years.

An attempt is made in this paper to summarize the problem of seismic excitation of constructed facilities, the present state-of-the-art of earthquake resistant design and the efforts which are being made to improve the effectiveness of these measures.

The Excitation

Understanding of earthquake induced ground motions has been developed dramatically this century with the aid of elastic rebound (Bolt, 1978; Reid, 1911) and tectonic plate concepts (Eiby, 1980). The first provides an explanation for the generation of waves within the body and crustal zones of the earth by sudden rock fracture when long term strains eventually develop to an unsustainable level (Figure 1). The second aids the understanding of the build-up of strainings consistent with differential movements of major segments of the earth's crust (Figure 2). Additionally, the development and installation of recording instruments has enabled an improvement in the understanding of ground motion. In the last twenty years more than one thousand strong motion earthquake records have been obtained. Nevertheless, reliable forecasting of earthquake activity is not yet possible. Although some value may be placed on estimates of the likely characteristics of future ground motion, no valid predictors for the timing of future earthquakes are available currently.

An additional problem faces those attempting to reduce the adverse effects of seismic waves on man-made constructions, namely that of the extremely variable and selective nature of the materials on the surface of the earth. These surface materials may exist in depths of a few centimeters to thousands of meters, and possess physical properties ranging from those corresponding to a strong base rock on the one hand to those of an unconsolidated loose soil on the other. The effect is to produce a final filter for the seismically induced waves propagating through the earth which typically changes their characteristics dramatically and produces localized excitations of very distinctive signature at the sites of individual constructed facilities.

The comprehensive approach to incorporating a range of variables and degrees of uncertainty into an engineering design study involves probabilistic considerations. However, when faced with the need to simplify an otherwise forbiddingly complex situation, standard earthquake resistant design engineers have chosen to treat the problem of defining seismic input excitation to buildings essentially as a deterministic one, despite general awareness of the limitations of this choice. The extent to which this approach has been vindicated will be discussed later in this paper.

[1]Reprinted by permission from *Interciencia*, July-August 1988, Vol. 13, No. 4.

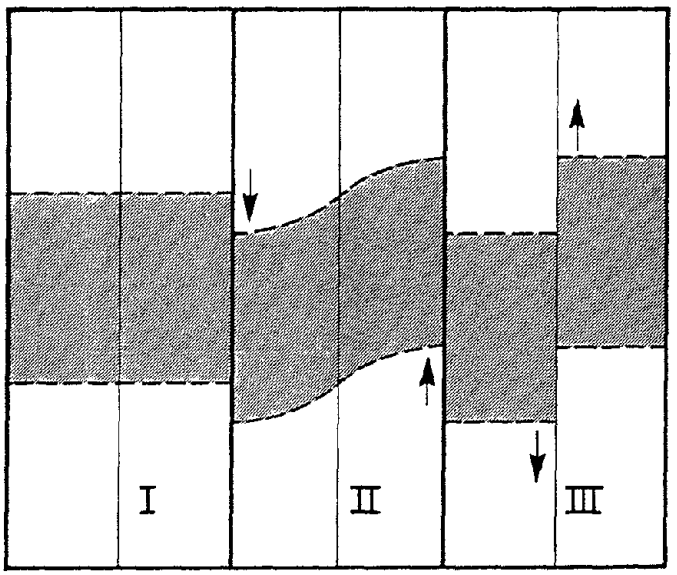

Figure 1: Elastic rebound: I unstrained material, II strained and deformed but unfractured, III strained beyond ultimate strength, fractured and reset in a new equilibrium position.

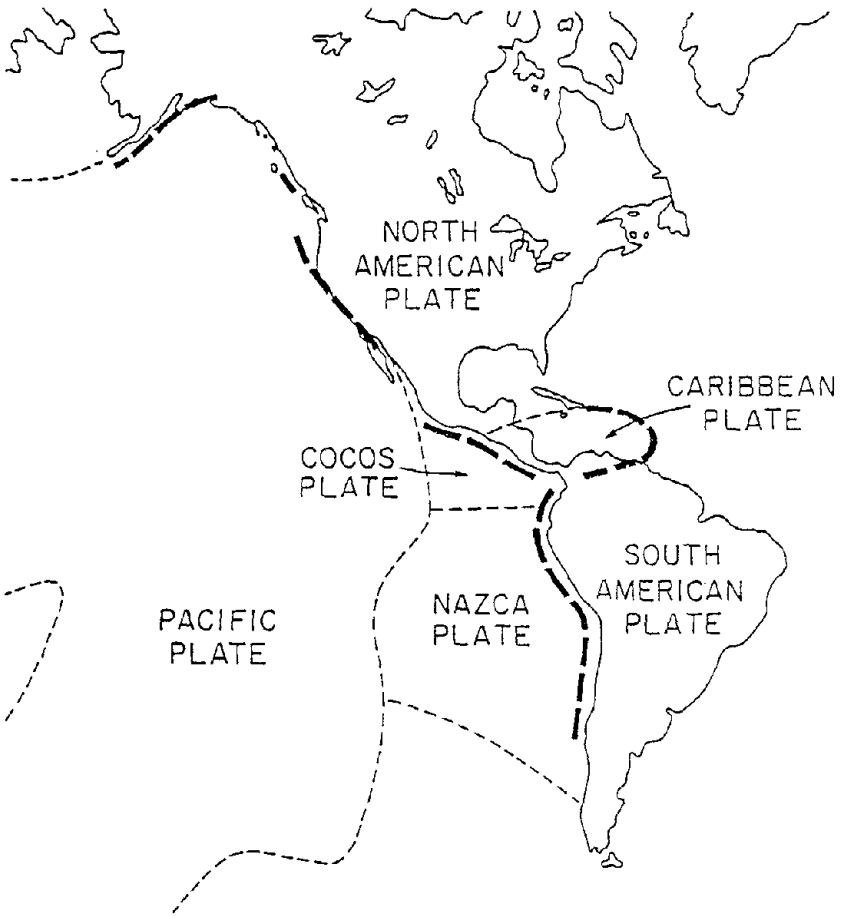

Figure 2. Tectonic plates associated with the Americas.

The Evolution of Buildings

As mankind changed from an essentially migratory existence to one characterized by permanent settlements, the desire for protection from the elements prompted the construction of buildings which reflected both the availability of materials and the harshness of the local climate. Ease of construction and long life expectancy tended to be interchangeable, yet required considerable effort to be achieved concurrently. Those societies which evolved in seismically active areas, where choices of materials were available, tended to eliminate those which were found to give rise to excessive problems under earthquake action in favor of those which behaved less disastrously. The good strength per unit mass properties of timber allowed satisfactory buildings to be developed where lumber was in adequate supply, whereas in those zones short of vegetation, natural stone or sundried bricks often constituted the only building material available. It was found to be much more difficult to provide buildings of adequate seismic resistance using these elements.

Step functions in the development of building styles were introduced intermittently by immigrants from places where earthquake activity was not a problem. These newcomers tended to favor the well established building techniques of their homeland, and met with only mixed success in transforming them to new locations. Other setbacks of lesser, but nevertheless noticeable, significance were occasioned by such catastrophies as major fires which destroyed early townships and thereby encouraged replacement of timber construction with buildings having greater fire resistance, but also being more prone to earthquake damage. The last fifty years have seen both the development of mandatory minimum seismic strength provisions (1984), and a widening of the gap between those societies which can afford to require compliance with a relatively stringent standard and those which, of necessity, cannot afford the initial costs of even a very low level of earthquake resistance. The recent explosive growth of urban population has, in many instances, compounded the problem in that it has proved extremely difficult to maintain even a pre-existing standard of construction when the demand for accommodation is increasing so quickly.

Lessons Learned from Earthquakes

As in many other areas of human endeavor, progress in the mitigation of earthquake induced building damage has benefited significantly from experience of past events. Individual owners, local and federal authorities and technical societies have each contributed to the fund of information collected as the result of post-earthquake investigations of building behavior.

Within the last fifty years, several hundred earthquakes throughout the world have been investigated. More recently a systematic attempt has been made to identify the nature of seismic excitation and building response, culminating in a comprehensive report (School, 1986) summarizing the important lessons so far learned and identifying the gaps in the knowledge required of further improvements in seismic resistance to be made. The fact that buildings affected by recent earthquakes have exhibited a range of response from virtually no damage to complete collapse may, to some extent, be explained in terms of the probabilistic nature of both the ground motion and the building response. However, other possibilities are that the lessons learned to date are incomplete or that they are not heeded. These aspects will be considered in more detail later in this paper.

Seismic Shaking and Building Damage

The shaking resulting from earthquakes at typical building sites is characterized by a relatively narrow band of frequencies. The range is prescribed by the properties of the materials lying at the surface of the earth as these form the final filter of the seismic waves. Periods of more than 2 seconds on very soft soil sites, to as small as 0.1 seconds on rock, have been measured.

The amplitudes of surface ground motion reflect both the distance from the energy source and the predominant site period, the longer periods on softer soil being associated with greater displacements. Double amplitudes of half a meter have been measured on soft soil sites, whereas peak to peak movement of a few millimeters are appropriate to a much more rigid site at a similar distance from the energy source.

Buildings typically have natural frequency of horizontal vibration in a range corresponding to periods of 0.1 seconds for single story structures to 4 seconds for a forty story structure. Consequently, they are particularly vulnerable to horizontal seismic shaking, and peak horizontal accelerations of the order of 0.05 g to 1.0 have been measured in buildings during damaging earthquakes.

Although vertical accelerations of similar or even somewhat greater magnitudes do occur, only rarely do these in themselves cause significant damage to buildings, as the normal safety margins used in design against the constant 1.0 g gravity load are adequate to ensure satisfactory resistance to the increments generated by earthquake action. Consequently, the bulk of building damage occurring in earthquakes can be ascribed to failure under horizontal forces generated by out-of-balance inertia effects resulting from each building attempting to stay still in space while the base suffers unusual displacements.

The response of a building is complicated by the loss of stiffness as damage occurs. This may prove advantageous if the effect is to remove the response frequency from close proximity to the predominant ground excitation frequency, but may be disadvantageous if it has the opposite effect and results in a better matching of the input frequency to that of the building. Strong ground motion excitation generated by typical earthquakes has a duration of the order of 30 to 60 seconds, in which time a building may experience ten or twelve major lurches in the horizontal plane. When the loads associated with these movements exceed the available resistance of the building, damage is unavoidable.

Building Code Provisions

Although the purpose of most building codes, namely to specify minimum standards of construction to ensure an acceptable level of safety, has been accomplished for many other loading situations, it has not yet been achieved for earthquake generated loads. Primarily, this is because of inadequate understanding of the dynamic properties of structures and materials, most particularly ability to assess accurately the energy dissipation capabilities of structural elements, and of the very variable characteristics of destructive earthquakes.

Some fifty years ago, the first efforts were made to include special provisions in building codes for earthquake resistance. These were very basic and have been developed progressively to the stage that almost all earthquake prone countries have adopted regulations for seismic-resistant design and construction. Although a common core can be identified in many of these codes, factors such as extent of industrialization, density of population and availability of building materials result in significant variations between them. The goal in all cases is to limit the number of deaths in future earthquakes to acceptable levels, and to restrict the long-term costs of repairing building damage to no more than the incremental cost involved in preventing the damage.

Clearly the effectiveness of all code regulations depends on the extent to which compliance can be ensured. Commercial pressures can result in less than full conformity being achieved, and even where the strict letter of a code is complied with, safety may be imperilled unless the spirit of the code is also met. All too often sight is lost of the fact that codes provide for minimum standards only.

Recent Severe Earthquakes

On the basis of an analysis of news media reports, it might be concluded that the severity of an earthquake is directly proportional to the number of casualties occurring; however, a more scientific consideration leads to the linking of

size with the magnitude of the energy released at the source. Earthquakes are normally ascribed a value on the open-ended Richter Magnitude scale on which a minor event would be 2 or 3, whereas the largest is of the order of 8.5. As the scale is logarithmic, a difference of two steps corresponds to a change in the energy of approximately three orders of magnitude. Of possibly more value as an indicator of damage is the local Intensity scale which is related to ground shaking at a particular location. A high value, possibly 10, would correspond to devastation of manmade structures.

Clearly, it is possible for a medium magnitude earthquake to provide high intensity shaking close to the source and thereby cause much damage, whereas a much greater energy release far from constructed facilities will give rise to much lower felt intensities at sites of possible building damage.

In the last fifty years, the Americas have experienced some forty significant earthquakes in the sense that both the energy released and the damage caused have been noteworthy (see Table I). It should be noted that several events, of smaller magnitude than those listed, have proved to have more significance to seismologists and earthquake engineers. This is particularly the case where a smaller energy release has been close to a major population center containing vulnerable constructed facilities, for example the city of San Salvador (Olsen, 1987). Some of the more significant aspects of building damage occurring in a selection of the events listed will be summarized in the following sections.

The Chilean Earthquake of May 1960

Of the many seismic events of the last fifty years, those occurring in Chile in May 1960 rank among the more destructive. Within the span of a few days, six shocks of magnitudes 7.5, 6.5, 7.5, 7.8, 7.5 and 8.4 occurred. These were followed by more than fifty aftershocks exceeding magnitude 5 in the next few months. Accumulated energy was released over a length of some 800 km as the ruptures progressed southwards. Extensive permanent land level change occurred together with landslides and ground settlement. Tsunamis were generated and volcanic eruption extended over several weeks. Very severe damage was sustained by constructed facilities including foundations, earthfills and harbor works. Brick buildings generally fared badly, whereas it was noted that "damage to earthquake sensitive structures of reinforced concrete, structural steel and wood frame was slight and the overall performance was quite satisfactory" (Steinbrugge & Rodrigo, 1963). Clearly the effect of some thirty years of gradual refinements of the code requiring provisions for earthquake resistance in buildings had proved beneficial, but the social and economic factors which dictated that large proportions of the population continue to live in unreinforced masonry structures contributed significantly to the loss of life.

The Alaskan Earthquake of March 27, 1964

The largest seismic event of this century in North America occurred on Good Friday in 1964, when a magnitude 8.4 earthquake between Anchorage and Valdez was followed by a series of very large aftershocks. Very extensive ground slide motion occurred causing severe building damage, in many cases essentially tearing houses apart at foundation level. Other damage was caused by shaking as distinct from large foundation displacement. It was noted that "the long period components of ground motion predominated. Some of the buildings which have relatively long periods of vibration suffered heavy damage; whereas small stiff structures such as small unreinforced masonry buildings often were unscathed even though they had little strength to resist the lateral forces" (Berg & Stratta, 1964). One specific lesson learned in Anchorage was that if precast concrete structural components are to be used in seismic prone areas, particular attention must be provided to ensure that the connections between these elements and other portions of the structure are adequate.

Table I: Significant Earthquakes of the Americas in the Last Fifty Years.

Year	Date	Place	Magnitude
1939	1/24	Chile	8.3
1940	5/24	Peru	8.4
1942	5/15	Ecuador	8.3
	8/6	Guatemala	8.3
	8/24	Peru	8.1
1946	11/10	Peru	7.4
1949	8/21	Alaska	8.1
1950	8/14	Argentina	7.3
1952	7/21	California	7.7
1957	7/28	Mexico	7.9
	10/4	Venezuela	6.7
1958	7/9	Alaska	7.9
1959	8/17	Montana	7.1
1960	5/22	Chile	8.5
1964	3/27	Alaska	8.4
1965	3/28	Chile	7.5
1966	10/17	Peru	7.5
1967	7/29	Venezuela	6.5
1970	5/31	Peru	7.8
1971	2/9	California	6.6
	7/8	Chile	7.5
1972	7/30	Alaska	7.6
	12/23	Nicaragua	6.2
1973	1/30	Mexico	7.5
1974	10/3	Peru	7.6
1976	2/4	Guatemala	7.5
1978	11/29	Mexico	7.8
1979	2/16	Peru	6.9
	3/14	Mexico	7.6
	10/15	California	6.8
	12/12	Columbia	7.7
1982	6/19	El Salvador	7.0
1983	3/31	Columbia	7.1
1985	3/3	Chile	7.8
	9/19	Mexico	8.1
1986	5/7	Alaska	7.7
1987	3/5	Chile	7.3
	3/6	Ecuador	6.9

Sources: Catalog of Significant Earthquakes, Major Earthquakes of the World, 1980-1987, Catalog of Earthquakes for South America, Terra Non Firma, Earthquake Spectra, Vol. 4, No. 3, August 1988, and Earthquake Tables by James M. Gere (1983).

The Venezuelan Earthquake, July 29, 1967

On the evening of July 29, 1967, a 7.1 magnitude earthquake occurred some 50 km northwest of Caracas at a depth of approximately 15 km. Some eighteen significant aftershocks followed the main event within a few days. In the four hundred years since the founding of the city, it had experienced many destructive seismic shakes consistent with its position close to the edge of the Caribbean tectonic plate. Nevertheless, a variety of building styles had survived, providing a representative cross-section including modern, seismically resistant designs. In this respect the results of the post-earthquake investigations were particularly significant in providing valuable information of relative behavior. A few thousand buildings suffered identifiable damage, a few hundred of a serious nature and a few score collapsed completely. Damage was distributed throughout the city of Caracas with three pockets of concentrated damage. Examination of the damaged and non-damaged buildings (Grases, 1968) prompted identification of lessons learned and relearned from this earthquake. These included awareness of the importance of adequate connections between structural components, sufficient strength of columns and the necessity to ensure compatibility of stiffness between the various portions of each building. In their report on this earthquake, Hanson and Degenkolb (1967) commented, "Compared to the usual structure designed only for gravity and wind loads, the earthquake resistant structure often requires an analysis that is several times as extensive. The more knowledge of earthquakes that is available and the more lessons that must be assimilated, the more time required by the engineer to design his structure. Because failures of details have been so prevalent in past earthquakes, he must present more instructions to the field in the form of drawings and details to be sure that critical points are adequately covered. The number of drawings to represent this detail to the construction crew is also several times that needed for purely gravity load design. And finally, the supervision and inspection must be more thorough to prevent those weaknesses that would otherwise remain hidden until the time of greatest stress, i.e., when the earthquake occurs." This outline of the problems facing those attempting to provide earthquake resistant buildings is as valid twenty years later, and goes some way to explaining the somewhat erratic success achieved in this field.

The Managua Earthquake of December 23, 1972

Nicaragua has a long history of seismic activity consistent with its proximity to the Middle American Trench. The west coast suffers much greater size and frequency of shaking and the relatively young city of Managua had been badly damaged on several occasions prior to the December 1972, magnitude 6.2 event. Several instrument records of the ground motion where obtained on this occasion making it possible to attempt to relate building behavior to measured ground movements. Peak horizontal and vertical accelerations of 39% and 33% of gravity respectively were recorded (Sozen & Mathiesen, 1975). Many of low-rise buildings consisted of adobe bricks filling a light timber framework, and many such structures suffered severe damage. Another group of buildings, essentially of low rise configuration, behaved in a manner consistent with effectively no seismic load provision enforcement and were also badly damaged. Several medium-rise, reinforced concrete buildings, embodying the then current principles of earthquake resistant design, behaved reasonably satisfactorily.

The property damage sustained was of the order of the annual gross domestic product of the country prior to the earthquake, and this clearly proved to be a very substantial economic disaster.

The Lima, Peru Earthquake of October 3, 1974

In the eight years preceding the 1974 event, Lima had suffered at least four other earthquakes of relatively close proximity, each exceeding magnitude 7.0. Hence, when the October 3, 1974 magnitude 7.6 quake occurred, the damage recorded is likely, at least to some extent, to have been cumulative in nature. Peak accelerations of 25% of horizontal and 16% vertical were measured in the Lima area where overall building damage was light. Several pockets of more severe damage were noted. In these, up to half of the older adobe and unreinforced masonry

buildings collapsed and several modern structures incorporating seismic resistant design considerations suffered severe damage.

It was concluded, as a result of investigations following this earthquake, that building damage was influenced significantly by local site conditions (Moran et. al., 1975). Mention was again made of the poor performance of unreinforced masonry and precast concrete construction. Poor response of inadequately detailed reinforced concrete frames was emphasized. The very satisfactory behavior of recently constructed high rise buildings was noted.

Although this was, from a seismological viewpoint, only a moderately severe earthquake with unexceptional felt intensities in built-up areas, it was estimated that the value of property damage was $M200.

The Mexican Earthquakes of September, 1985

The interaction of the Cocos and North American tectonic plates maintain a particularly active seismic region along the southwest coast of Mexico. Two major energy releases (magnitude 7.8 and 7.6 respectively) occurred on November 29, 1978 and on March 14, 1979, but these were overshadowed by the magnitude 8.0 event of September 19, 1985 and the magnitude 7.5 one of the following day. Both originated close to the Michoacan region which had been identified earlier as a high probability area for significant seismic action. Reports of the number killed are inconclusive, but a death-toll of 10,000 appears probable and the direct financial loss exceeds $4 billion. Although the epicenters were close to the Pacific coast and some severe damage was sustained along the coastal zone, catastrophic failures of buildings occurred also in Mexico City, some 400 km away. Two years after the September 1985 shaking, some 50,000 people were reported to remain homeless, notwithstanding that 250,000 of those whose homes had been destroyed had been successfully rehoused.

The September 19th, 1985 event produced ground motions of exceptional regularity and intensity, lasting more than three minutes in parts of Mexico City (1987). These motions are inexplicable in terms of magnitude and focal distance alone, and are clearly the result of some load path peculiarity. Records obtained indicate that the ground movement in the east-west direction increased almost linearly for forty seconds up to 17% of the acceleration of gravity with a predominant period of two seconds (Figure 3). The peak double amplitude of the motion was 40 cm with a maximum velocity of 61 cm/sec. It appears probable that in the course of the earthquake, some buildings lost stiffness progressively and thereby moved into the worst frequency excitation range, suffering consequently greater damage.

Notable aspects of the responses of major buildings included their propensity to pound against adjoining structures (Figures 4 and 5), the weakening effect of flexible lower stories, the destructive action of torsional motion, the many cases of catastrophic foundation failure (Figures 6 and 7) and the unusual phenomenon of upper stories in some buildings collapsing while lower portions survived (Figure 8). Local structural failures can be attributed to inadequate ductility, brittleness, buckling and progressive deterioration. Some indication of the age, size and form of the most severely affected structures is provided in Tables II through IV.

It is necessary to exercise considerable care in interpreting these data as the significance of the figures listed cannot be properly assessed in the absence of details of the total building stock. For instance, without taking into account the number of buildings of a particular category which existed at the time of the earthquake, it is clearly risky to interpret the damage figures as showing one type of material to be inferior to another. However, it is clear that buildings of intermediate height suffered unexpectedly severely and that many previously identified undesirable construction characteristics contributed generally to the damage. These include poor design detailing and inadequate materials.

Table II: Relationship Between Height and Number of Collapsed or Severely Damaged Buildings.

Number of stories	Number of buildings
≤ 5	129
6-10	161
11-15	34
> 15	

Table III: Relationship Between Year of Construction and Number of Collapsed or Severely Damaged Buildings.
(It should be noted that significant changes to the building code were made in 1957 and in 1976.)

Year of construction	Number of buildings
1957	82
1957-1976	192
1976	52

Table IV: Relationship Between Damage and Type of Building Material.

Building Material	Extent of Damage	Number of Buildings
Reinforced concrete	Collapsed	82
	Severely damaged	45
Steel	Collapsed	10
	Severely damaged	2
Flat Plate	Collapsed	91
	Severely damaged	44
Masonry	Collapsed	13
	Severely damaged	23
Other	Collapsed	14
	Severely damaged	6

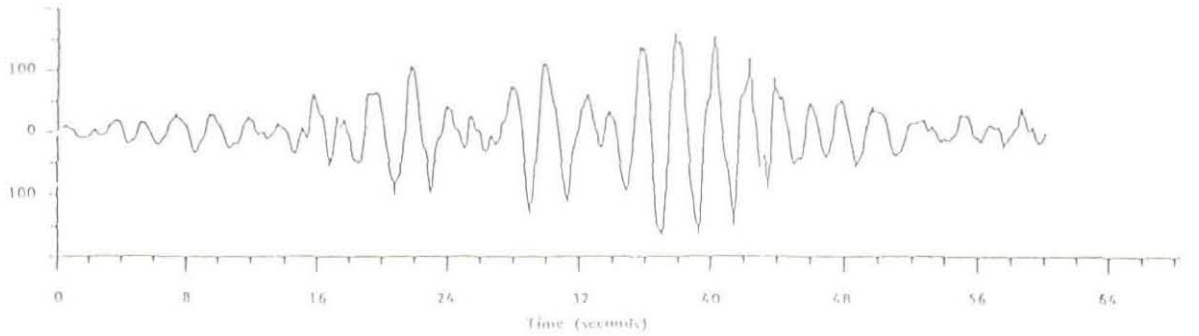

Figure 3. East/West component of ground motion measured in the September 19, 1985 Mexico earthquake (Note: vertical axis in gals. 1000 gals. equals acceleration of gravity).

Figure 4: Evidence of pounding of adjoining buildings: structural cracking and filling of original seismic gap with debris.

Figure 5. Evidence of pounding: steel beams in upper level permanently bucked outwards.

Figure 6: Foundation pile pulled out of ground by toppled building.

Figure 7. Foundation failure: right hand building settled almost a full story height pulling down adjoining part of left hand structure.

In recognition of the fact that the survival of buildings such as hospitals and fire stations is of particular importance, the majority of building codes require such structures to be constructed to a higher level of earthquake resistance than that of standard buildings. The justification for this provision was demonstrated in Mexico City where structures in the hospital complexes collapsed on September 19, 1985. Two buildings in the Central Medical Facility fell down: the Central Mechanical plant, and a portion of the Cardiology complex. Several other buildings were damaged so severely that they had to be demolished. At the Benito Juarez hospital, the main building "pancaked" with complete disintegration of the structure between the floor, allowing the concrete floor to sandwich everything between them as they collapsed.

A particular problem arises when buildings subject to violent ground motion are not symmetric in plan. The inertia forces then serve to twist the structure about its center of rigidity, giving rise to torsional motions which tend to be severely damaging. The layout of Mexico City, involving several major thoroughfares intersecting diagonally with an otherwise orthogonal street system, produces many choice corner lots having triangular or trapezoidal shapes. Most of the buildings erected on these lots reflect the shape of the site available and this, coupled with the desirability of having relatively open lower stories facing the streets and consequentially stiffer faces on the rear sides of the buildings, results in structural systems which are necessarily asymmetric in plan and are hence vulnerable to torsional excitation (Figures 9 and 10). The significant number of corner lot buildings which collapsed or were very severely damaged can be accounted for in terms of severe torsional response to the seismic shaking.

Lest it should be inferred otherwise, it should be noted that there were far more examples of satisfactory structural performance than of unsatisfactory behavior. A twelve story building which had been extensively repaired and strengthened following the 1979 Mexican earthquake survived in 1985 with no major damage. The forty-three story Latino Americano tower added to its reputation for surviving major seismic events with only minimal non-structural damage. The fifteen year old National Lottery Building is twenty-five stories in height and has a footprint of triangular shape. Although within two blocks of the totally collapsed Regis Hotel, and hence most probably subjected to much the same shaking, the National Lottery Building suffered no serious damage and thus vindicated the designer's choice of a steel built-up box column and truss girder structural configuration. The three hundred and thirty buildings referred to in Table IV represent less than 1% of the observed response of engineered buildings in the zone of greatest damage in Mexico City. Nevertheless, the lay public may, with every reason, inquire into the circumstances of the survival of many historic buildings erected without appreciation of modern design concepts, and the failure of some fifty buildings erected in Mexico City within the last ten years, supposedly in compliance with the appropriate design codes which themselves had been subjected to systematic upgrading in the first thirty years. Although it should be remembered that only a relatively few precode buildings continue to survive successive earthquakes, and that may be primarily as a result of a possibly fortuitous set of circumstances which prompt mismatching of seismic input and structural response, clearly there is reason for concern that relatively new structures have proved to be susceptible to the extent demonstrated in the 1985 Mexican experience.

Code Development: An Ongoing Process

Each major seismic disaster tends to focus attention on the problem of earthquake damage mitigation and thereby creates an environment favorable to code refinement. Unfortunately, human memories tend to be very short and even a few decades of apparent seismic inactivity result in pressure for relaxation of the standards themselves, or of observance of those legally required. The earthquake engineer, therefore, has to accommodate periods of varying public sympathy for his efforts to gain acceptance of more rigorous standards. The fact that improvements have been achieved is a reflection of the persistence and conviction with which the cases have been presented. Those occupying buildings which do comply with both the letter and spirit of the more sophisticated current seismic design codes can be assured that the odds on their surviving future earthquakes are much better than those enjoyed by occupants of structures constructed earlier, notwithstanding the continued representation of the complex problem of seismic loading in an essentially simply deterministic manner.

Figure 8. Upper portion of building failed.

Figure 9. Lower story failure of corner building having triangular footprint.

Figure 10. Failure of corner building indicating torsional motion.

Conclusion

The life expectancy of both man and of the majority of the buildings he constructs are of the same order and quite small by geological time scales. Consequently it appears reasonable to base our expectations of future seismic activity on available records accumulated in the relatively recent past. We can then forecast the probability of selected sized ground shaking within chosen time frames. As yet, it is not possible to predict the specific time of a given event within a few score years, but nothing is more certain than that the rate of energy release in those tectonic zones active in recent centuries will continue essentially unchanged throughout the lifetimes of contemporary man-made constructions.

As awareness and understanding of the nature of the seismic problem increases, it can be anticipated that our ability to provide damage-resistant building will continue to improve. The extent to which our societies elect to expend resources on overcoming the effects of this particular natural disaster, rather than allocating these resources in alternative directions, will almost entirely dictate progress in mitigating damage suffered by buildings in future earthquakes.

Acknowledgement

The information included in Table II, III and IV was drawn from a presentation made by Dr. Emilio Rosenblueth to the February 1986 San Francisco meeting of the Earthquake Engineering Research Institute.

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Part II

Safety and Preparedness in the School: An Overview

2-1 Why Plan?
2-2 The Earthquake Threat to Orange County
2-3 Evaluating Other Hazards in Your Area
2-4 Non-Structural Hazard Mitigation for Schools
2-5 School Preparedness Supplies and Student Emergency Comfort Kits
2-6 Computers and Clip Art: Getting the Earthquake Preparedness Message Across at a Reasonable Cost
2-7 American Red Cross and Schools: Partners in Preparedness Response
2-8 Working with Your City

Why Plan?

By Robert Peterson, Ph.D.
Orange County Superintendent of Schools
Orange County Department of Education

and Frances E. Winslow, Ph.D.
Emergency Management Coordinator
City of Irvine

Educators usually consider the needs of the children, the safety of school buildings, and the availability of response supplies when designing earthquake preparedness plans for schools. There is one other piece to the preparedness picture that enables all the rest to function effectively. Each member of the school staff must take responsibility to become personally prepared to face the obligation of earthquake response and recovery. This task has two phases: making a family plan, and making a personal preparedness kit.

Making a Family Plan

Educators need to start earthquake preparedness efforts at home with their own families. First, gather the family members to discuss what will happen during and after an earthquake. Explain the educator's obligation to remain in the classroom until released by the senior administrator. Review where other family members will be if they are not at home when the earthquake strikes. Consider how these people will return home, and how long it is likely to be before they return home. Review all earthquake safety rules. Discuss where in your home good "duck and cover" spots are located.

If some of the family members are little children, review carefully plans at day care centers, or with baby sitters. Make sure that they know that it may be some time before a parent comes for the child. Be sure complete emergency release and contact information is provided, and that records are kept up to date. Check school age children's school emergency plans. Make sure that the school has a program to provide response and recovery supplies on site. Keep emergency contact information up to date, and be sure that school administrators know that you are obligated to remain at your job. Do not select anyone to be listed on your emergency release form unless you are sure that that person can provide for your child physically and psychologically after an earthquake for the period of time it is likely to take you to get home.

Next, prepare your home. Survey your residence for hazards, and undertake a program of non-structural mitigation. Start by strapping the water heater, and checking to see that the gas meter shut-off valve is working. Call the gas company to service the valve if it is stiff. Make sure that family members all know the location of the gas meter, and the safety rules for when and how to turn it off. Be sure no one tries to turn it on again.

Finally, develop an earthquake safety supply kit for the family. Assemble rescue tools, flashlights, and a checklist of "first tasks" in a container that everyone can handle. Develop a supply of food requiring little preparation that can be rotated through usual meals. Have a first aid kit with eye wash, eye pads, dust masks, absorbent bandaging and splint material in a sturdy container, preferably near the earthquake tool kit. Make sure that everyone knows the basic first aid rules, and include information on where to get medical help after an earthquake in the kit.

Making a Personal Preparedness Kit

The personal preparedness kit will make the response and recovery period after an earthquake much easier and could be a key to business resumption in the educational environment. Commercially available kits contain items such as food, water, first aid supplies and small rescue tools. "Car kits" can provide a good basis for the educator's personal kit. However, additional steps should be taken to make the kit really useful for the educational environment.

Ideally, each family member should have an earthquake kit at business or school. There should also be a kit in every car. Earthquakes strike when people are on the freeway, at the mall, at the theater, or driving in the country. A car kit may be the difference between life and death from severe bleeding, dehydration, or hypothermia.

The educator's kit should be kept under the desk in the classroom, tethered to a leg of the desk by sturdy cord. Remember that during an earthquake everything is in motion. You will be holding on to the desk as it moves around the floor. If your kit is tethered to the desk, it will move along with you, providing ready access to supplies should you become trapped as a result of the earthquake. This kit need not duplicate everything in your car if you routinely drive to work. It should, however, contain first aid supplies for severe bleeding, and eye wash. Earthquakes are very dusty events. It should also contain a flashlight, a pair of work gloves, and a supply of water adequate for 12 hours. If you take prescription medication regularly for life-threatening conditions, a 24 hour supply of the medication should be in this kit. You should never leave the house with less than a three day supply of such medication in a pocket or purse. These supplies should be rotated on the first of each month so that they are never out-dated.

Also keep a supply of any patent remedies that you use regularly, especially when under stress: decongestants, head ache remedies, indigestion remedies and so forth. Rotate the stock at least every six months.

In addition to these basic supplies, which can be stored in a small gym bag, other supplies should be kept, either on-site in a locker, or in the trunk of your car. Most people dress in business clothes for teaching. Should search and rescue work be needed, these clothes may not be appropriate. A jogging suit and t-shirt provides a simple change of clothes that allows for freedom of movement. People assigned to search and rescue teams or first aid teams should ask their supervisors about getting coveralls through the district's central supply. If these are not available, a second jogging suit and t-shirt should be available in case the first set is damaged. When your jogging shoes are too worn for athletic use, add these to your supply along with two pairs of socks and a change of under clothing. Moist towelettes, a small bottle of mouth wash, deodorant, and tooth brush and tooth paste are welcome additions to the kit. Shaving and personal sanitation supplies should also be included.

The car kit should also include a roll of quarters. Before central office service is restored to phones, the phone company plans to bring mobile pay phone trucks into effected areas. These phones do not rely on the central office, and would allow you to reach the out of state contact to report your condition and learn about your family members. You will need change to use these phones. A pack of pre-stamped postcards is also useful. Mail service usually resumes very quickly, and you can use these cards to reassure other family members of your welfare so that they do not deluge the American Red Cross with health and welfare inquiries about you.

After a disaster, food is a psychological comfort item. Include chewing gum, hard candy, crackers, or other snack foods that will help you in a time of stress. Also consider activities that will help relax you in a stressful environment. Some people like to read, or do crossword puzzles, or play cards. Select an activity that appeals to you, and include the necessary materials in your kit. Also consider including a list of activities that you can do with the children in the classroom once the damage assessment has been completed. Word games, simple contests, and story-starters will help you to keep the children calm and entertained while they await their parents.

From Aware to Prepared

The rest of this conference is designed to assist you in moving from a stance of awareness to a condition of preparedness for the inevitable earthquakes on the San Andreas Fault and the Newport Inglewood Fault. Some of the activities described to you in the coming sessions will require consensus, funding and administrative support. Family plan making and personal comfort kit creation are entirely up to you. You have the information, now you should have the inspiration. Make this your first step on the path to earthquake preparedness in your school district.

Hang this up. Follow these tips.

AFTER THE EARTHQUAKE

1. **CHECK YOUR GAS METER.** Use a chemical light stick or flashlight. DO NOT USE MATCHES OR CANDLES. If the numbers on the meter are rotating rapidly, or if you smell gas or hear gas escaping, shut off your gas.

HOW TO SHUT OFF THE GAS IN EMERGENCIES

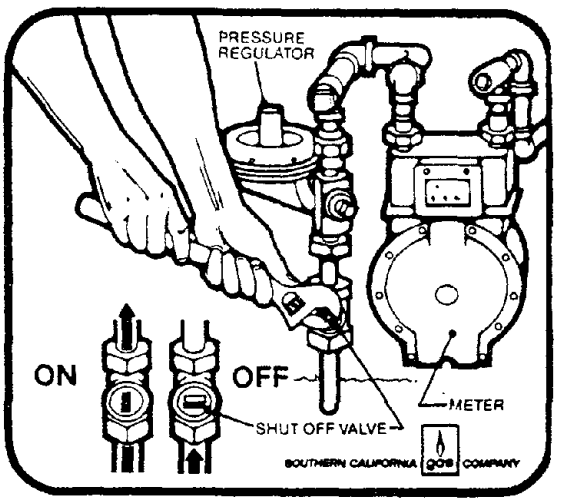
BEFORE

- Know where your gas meter is located before an emergency occurs.
- Have a **wrench** stored in a specific location where it will be available.

AFTER

- If you smell or hear gas escaping after an earthquake or any emergency, turn off your gas at the meter as shown.
- Contact the Gas Company to have your service restored.

There are also emergency instructions in the front of most telephone directories.



TURN OFF ALL OPEN PILOT LIGHTS.

2. **HANG UP YOUR PHONE.** Phones are often dislodged by the shaking. Make sure all instruments are properly seated. DO NOT USE YOUR PHONE EXCEPT TO DIAL 911 IN AN EMERGENCY! Before the earthquake, plan for alternative emergency communication: amateur radio, CB, local elementary school.

3. **TURN ON THE EMERGENCY BROADCAST SYSTEM STATION** on your portable radio. Listen for information and special instructions while you complete this list of tasks. The stations for Irvine are provided on the attached sticker. Put it on your TV NOW, then you'll know where to look after the quake.

4. **TURN OFF ALL MAJOR APPLIANCES. UNPLUG SMALL APPLIANCES.** Toaster, coffee maker, hairdryer, electric toothbrush should all be unplugged. Washer, dryer, dishwasher, refrigerator should all be turned off at the switch. TURN OFF COMPUTERS as soon as possible to safeguard your data. Listen for emergency information before restarting computers, as sudden interruptions of power can destroy data.

5. **SURVEY YOUR HOME FOR DAMAGED WALLS.** Damaged interior walls may indicate broken wiring. Shut off electrical power to effected areas at the circuit breaker.

6. **CHECK WATER PRESSURE.** If water is flowing, fill containers for drinking water, and fill a bath tub half full for washing. If water is not flowing, turn off the water at the house service line. If all pressure is lost in the water line, the fresh water stored in your toilet tanks and hot water heater could flow back down the water line unless it is shut off.

7. **CHECK YOUR NEIGHBORS' GAS METERS.** Take your wrench and go down your block to check for obvious gas leaks. If a neighbor's house catches fire, yours may burn down too!

8. After checking your water pressure, **CHECK FOR BROKEN WATER PIPES WITHIN YOUR HOUSE.** Be sure all water faucets are turned off, then check the water meter. If the numbers are revolving, you have a leak. Turn off the water at the house service line.

9. **CHECK SEWER FUNCTION.** Partially fill a small sink, then release the water. If it flows freely, the line is clear inside the house. Then check the outdoor sewer connection. If there is no obvious wet area, the soil pipe from your house is probably intact. Use caution before emptying a washer or flushing a toilet. Plug bathtub and sink drains to prevent sewage back-up.

10. **SURVEY YOUR HOME FOR PARTIAL DAMAGE THAT WILL BE MADE WORSE BY AFTER SHOCKS.** Remove broken glass from windows. Reinforce, board-up or dismantle damaged walls, doorways, chimneys. Move objects blocking exits. Clean up sharp or slippery debris, spilled medicines, chemicals and other hazardous materials. Open exit doors, which may be jammed by earthquakes.

11. **GET TOGETHER WITH YOUR NEIGHBORS.** Make sure the elderly, disabled and people with small children are OK. Begin neighborhood self-help to accomplish these above 10 items on both sides of your block. Set up a first aid point, make a community meal, listen to your emergency broadcast station continuously for further developments. Review your "Earthquake Preparedness" Booklet for further ideas on post-earthquake safety. By pooling your resources, you can conserve and survive.

Provided by:
THE CITY OF IRVINE, EMERGENCY SERVICES SECTION
17200 Jamboree Road, Irvine, CA 92714. 714-660-3721.

AFTER AN EARTHQUAKE

HOW DO I KNOW WHETHER OR NOT TO TURN OFF THE GAS VALVE?

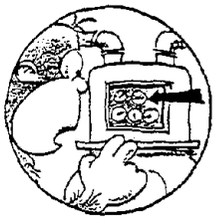
GOOD QUESTION.

You *DON'T* always have to turn it off.

Restoring service takes time and skills; following a quake, it takes *the Gas Co. WEEKS to restore service to the thousands* who turned their gas off! An unnecessary shut off can cause unnecessary inconvenience.

SO, HOW DO I TELL?

Follow these guidelines, they'll help you decide if it's necessary:



1. CHECK . . .
your gas meter: if any of the hands are going around rapidly, there probably is a leak.

3. SMELL . . .
for the distinct odor of leaking gas.

2. LISTEN . . .
for the hiss of a leak around your building.

4. LOOK . . .
for any apparent damage to structure that may have damaged gas lines or appliances.

(WARNING: It is very dangerous and not recommended to go looking for gas leaks inside any damaged building.)

WHAT IF I ALREADY TURNED THE GAS OFF?

For your safety, DON'T TURN IT BACK ON!

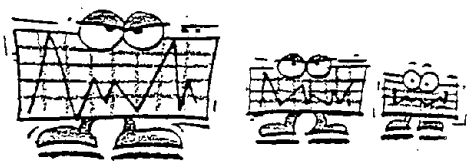
Call the Gas Co. as soon as possible and PLEASE be patient. Your gas company will restore service as soon as possible. You may also contact a qualified, licensed plumber to check your piping and restore gas service.

OVER

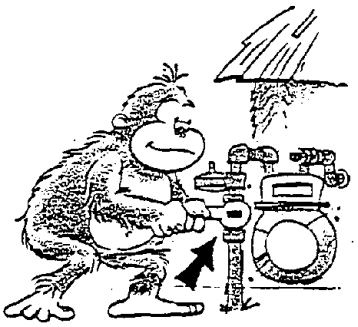
CITY OF IRVINE • EMERGENCY MANAGEMENT SECTION • P.O. BOX 19575, IRVINE, CA 92713 • (714) 724-7149

WHAT ABOUT AFTERSHOCKS?

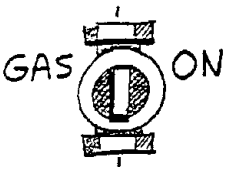
They are normal and can last for weeks after a shock. They can cause new or additional damage. Check for leaks following each aftershock.

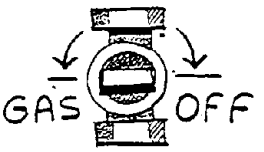


SO HOW DO I TURN THE GAS OFF?



Turn the shut off valve ¼ turn either way to shut gas off.





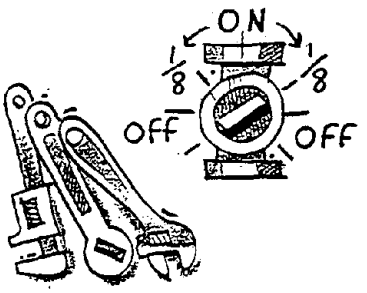
WHAT CAN I DO BEFORE A QUAKE?

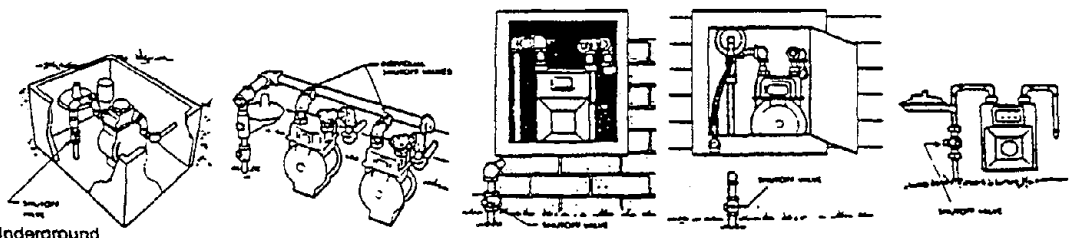
It's smart to keep a tool handy, know how to shut gas off and to spot any problems early.

Using a wrench, turn the shut off valve left or right 1/8 turn to determine that valve turns freely. ***NO MORE than 1/8 turn*** or you'll turn the gas OFF.

Check your pilot lights or gas appliances. If you did accidentally turn your gas off, call the Gas Co. to restore service.

If your shut off valve is too hard to turn, call the Gas Co., to adjust or replace it.





TYPICAL GAS METER INSTALLATION

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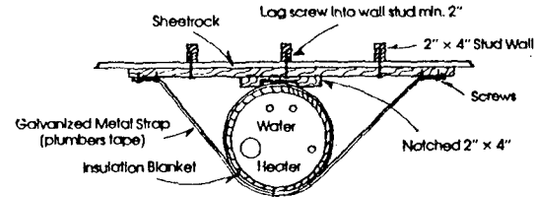
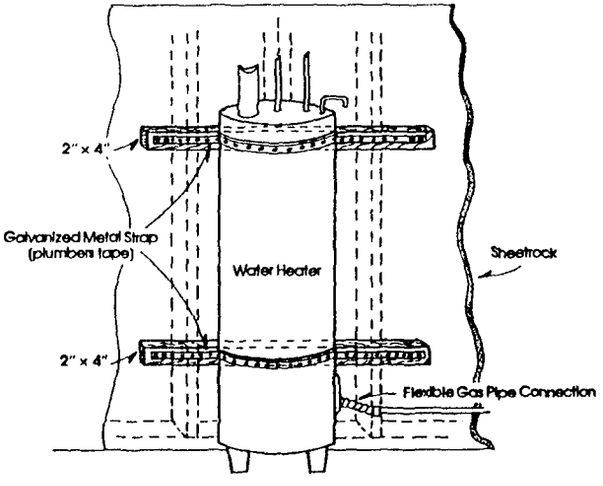
PROJECTS EVERYONE SHOULD DO

STRAPPING YOUR WATER HEATER PROJECT





MATERIALS NEEDED		TOOLS NEEDED	
Roll of Plumber's Tape	16d Nails	Hammer	Drill
Flexible Supply Line	Insulation Blanket	Crescent Wrench or Socket Wrench	Stud Finder
2 x 4 Lumber	Washers	Screwdriver	Pencil
#10 x 2" Oval Head Screws		Hole Punch	
3/8" Lag Screws		Drill Bit	

1 Locate studs in wall on both sides of water heater.

2 If 2 x 4's are covered by sheet rock, etc., cut out a narrow slice in order to find the center of the stud. (This is important when attaching the lag screws.)

3 Nail 2 x 4's to studs to keep them lined up. Mark hole to be drilled to correspond with center of studs.

4 Drill hole into 2 x 4's approximately 2" into wall studs.

5 Insert 3/8" lag screws and washers into 2 x 4's and studs. Screw in as far as possible.

6 Wrap insulation blanket around water heater.

7 Wrap plumber's tape around water heater. (Plumber's tape should be wrapped around entire water heater at least once.) Secure plumber's tape to 2 x 4's with screws; use screws as needed to take up the slack in the plumber's tape.

8 Nail or screw 2 x 4 spacers between water heater and wall to create a snug fit. (Notch out a portion of 2 x 4 for the water heater to fit into.)

NOTE: These instructions and specifications are only for a water heater which is within 6" of a wood framed wall.

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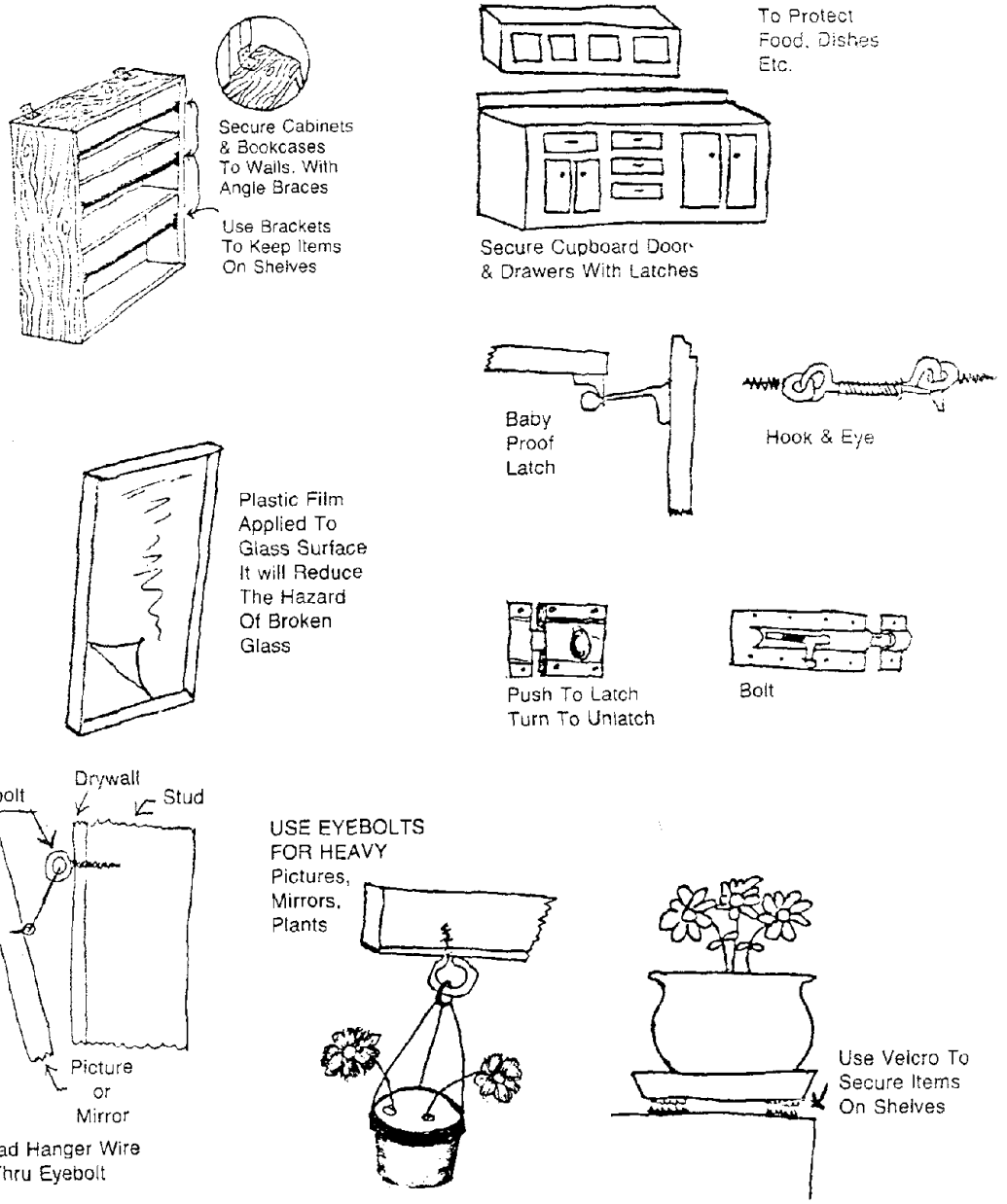
HOUSEHOLD HAZARDS



CITY OF IRVINE

EMERGENCY MANAGEMENT SECTION

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Are you prepared for an earthquake?

Here are some tips to consider about earthquake preparedness:

Water Storage

Q: *Why should your family store water?*

A: You and your family can survive for several days without food, but only for a short time without water. Store a two-weeks supply of water for each member of your family. Also be sure to include enough water for any pets you have.

Q: *How much water is necessary?*

A: In moderate weather a normally active person requires a minimum of 1/2 gallon of water per day for drinking and food preparation. *Note: Additional water will be required for bathing, brushing teeth and dishwashing.*

Q: *Where can water be found in an emergency?*

A: Water can be taken from ice cubes, hot water tank, toilet tank (not toilet bowl). Do not use water from the toilet tank to drink if chemical disinfectant or purifier has been added to the water. Be sure to turn off gas or electricity to tank before draining off water for emergency use.

Q: *How long will water last?*

A: Commerically bottled water stored in 5-gallon, heavy plastic containers are well sealed and will last for an extended period of time. The lightweight 1 and 2.5 gallon containers are less expensive and easily available but are not as durable and may leak after one year.

Water Tips

- When bottled water is stored in plastic container over long periods of time or at elevated temperatures it may develop some plastic taste and odor. However, the water will remain bacteriologically safe and chemically stable indefinitely, provided the container remains unopened.
- To increase shelf life of the water stored in translucent plastic bottles, store in dark area away from light.
- Check water supply every 3 months for leakage, evaporation, and outside contamination, and replace as needed.
- To purify drinking water use any of the following methods:
  - Boil for 5 - 10 minutes
  - Add 10 drops of household bleach per gallon, mix and let stand for 30 minutes. A slight smell or taste of chlorine indicates water is good to drink.
  - Use purification tabets, follow instructions

Food Storage

Here is a list of food items you can store

Canned Protein:

__ salmon __ sardines __ tuna
__ ham __ chicken __ beef
__ lunch meat

Canned Vegetables:

__ beets __ carrots __ peas
__ green beans __ spinach __ corn
__ sweet potatoes

Canned Fruits:

__ pineapple __ apricots __ peaches
__ apple sauce __ fruit cocktail

Dried Fruits, Nuts & Seeds:

__ raisins __ peanuts __ prunes
__ assorted nuts __ sunflower seeds

Also Include:

__ tea bags __ intstant tea __ coffee
__ peanut butter __ fruit juices __ soups
__ pet food __ hard candy __ vitamins
__ beef jerky __ flavored beverage powders
__ cheese spread __ hi-protein bars __ cocoa

What to do in the event the electricity is off ?

Be sure to do the following:

1. Use perishable foods and foods from the refrigerator first.
2. Use foods from the freezer.
3. Use non-perishable foods last

Do you have an adequate first-aid kit?

Your first-aid kit should include the same kind of supplies that professionals use:

- One role of adhesive tape one-half inch to 1 inch wide and 3 to 5 yards long.
- Twelve 2-by-2-inch sterile gauze pads.
- Six 4-by-4-inch sterile gauze pads.
- Two gauze roll bandages, 2 inches by 5 yards.
- 16 to 24 adhesive bandages.
- Tweezers.
- Scissors.
- Two large sterile dressings, about 8 inches by 7 1/2 inches.
- Safety pins.
- Six packaged antiseptic swabs
- Six eye pads.
- Antiseptic spray or oinment.
- A blanket.
- A good first-aid book, such as *Standard First Aid & Safety* by the American Red Cross.

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EARTHQUAKE EMERGENCY KIT

FOR CAR OR DESK

WATER. This is your most important item. You will need water to drink, for first aid, and to take medicine. Be sure to stock 1 gallon per person per day at home. In your kit, have at least 1 gallon of water. It should be in a sealed container in a box or dark bag to protect it from sunlight. You could purchase a box of foil packets or some cans of water at a camping store.

FOOD. Food is important for psychological reasons. You will also need to keep your blood sugar level up to avoid dizzy or shaky feelings. People with diabetes, heart disease or other health problems should consult their physicians for advice about the foods for their kits. The healthy general public should select foods like crackers, peanut butter, snack packs of fruit, pudding, granola bars, dried fruit, single serving cans of juice. Plan on four light meals per day. Avoid high sugar foods like candy and soft drinks, as they make you very thirsty. Avoid alcoholic beverages.

LIGHT SOURCE. A chemical light stick provides long shelf life and a sparkless source of light. A flashlight with a special long-life battery, or a long-burning candle may be used after you have checked the area to be sure that there is no leaking gas or petroleum in the area. Do not rely on a regular flashlight. The ordinary batteries lose their power quickly in the heat of a car. You might consider an electric light with an attachment to your car cigarette lighter, available at camping stores.

RADIO. Your car radio is your source for emergency broadcast information. Get a list of EBS stations for the areas where you live, work and areas you drive to or through. Keep this list in your glove compartment, and in your emergency kit. You should also keep a small battery operated radio at work. Be sure to change the batteries every 6 months, even if the radio is not used.

EMERGENCY BLANKET. Mylar emergency blankets are available at camping goods stores. A thermal blanket may be substituted.

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FIRST AID SUPPLIES. Include band-aids in a variety of sizes, anti-bacterial ointment (Neosporin, Bacatracin, etc.), burn cream, rolls of gauze, large gauze pads, roll of first aid tape, scissors, large cloth square for a sling or tournequet, safety pins, needles and heavy thread, matches, eye wash, aspirin, chemical ice pack. Also, carry in your pocket at all times a minimum 3 day supply of any prescription medications you MUST take. Keep this supply fresh by rotating it every week. Also include any special medications you often use: nose drops, antihistimine, allergy remedies, diarrhea medications, indigestion medication.

PERSONAL CARE AND HYGIENE ITEMS. Container of Handi-Wipes or similar product, small plastic bottle of pine oil or other disinfectant, six large garbage bags with ties for sanitation and waste disposal, box of tissues, roll of toilet paper, plastic bucket to use a toilet. (Your smaller kit items can be stored in your bucket inside a sealed trash bag.)

ADDITIONAL ITEMS TO CONSIDER. Sturdy shoes (especially if your work shoes are not good for walking), sweater or jacket, hat/sun visor, mouthwash, feminine hygiene supplies, whistle (to attract attention and call for help), rope or string, pencil and tablet.

DON'T LET YOUR GAS TANK FALL BELOW HALF FULL! The radio and heater in your car may save your life, but you can't run the car's accessories long without the gas to start the engine and re-charge the battery. If you travel in isolated areas, on the freeway, or far from home, an adequate gasoline supply is crucial. Fill up often. After the quake the gas pumps may not work for several days while electrical power is restored. Once the pumps work, the supplies will quickly be depleted through panic buying. NEVER CARRY CANS OF GAS IN YOUR TRUNK! A can of gas is a bomb!

The Earthquake Threat to Orange County[2]

By David R. Hill
Police Officer
Orange Police Department

On the afternoon of May 2, 1983, an earthquake measuring 6.7 on the Richter Scale occurred in the City of Coalinga. Damage was extensive. Several hundred injuries were recorded. The jolt was felt in Sacramento to the north, Los Angeles to the south, and Reno, Nevada to the east.

On the morning of September 19, 1985, an earthquake measuring 8.1 on the Richter Scale occurred in Mexico City. The earthquake damaged over 7,000 buildings, nearly 1,000 severely enough to collapse or be demolished. Official estimates of number of deaths exceeded 7,000, and hundreds of thousands were left homeless. Estimates of economic loss range upwards of four billion dollars.

Geologists have forecast a 50/50 chance of Southern California being struck by a great earthquake (8.0 or better) within the next fifteen years. The signs of the movement of the Pacific and North American Plates are unmistakable, sooner or later the ground will yield again. When the next great earthquake strikes Southern California, the impacts to Orange County will be enormous. Police, fire, utilities, and medical services will all be swamped. Cities within the county, together with neighboring counties that would normally help each other out in a large emergency, may be too busy dealing with their own problems to provide mutual aid. It may take days or weeks in many areas to restore electricity, gas, water, or telephones. It will be difficult to travel anywhere.

The Mexico City earthquake provides the first historic example of recovery and reconstruction following major earthquake damage to a modern metropolitan area. All the problems faced by the City of Coalinga and Mexico City will appear following the next major earthquake in Southern California, in even more severe form. One of the major lessons for us will be the need for increased mitigation measures, such as strengthening building code enforcement. The socioeconomic losses suffered by Mexico City underscore the cost-effectiveness of hazards reduction at all levels of County government. Without serious efforts to reduce structural vulnerability, we can also expect significant losses in Orange County. Mexico's emergency management plan did not seem to work effectively. We must ensure that our plans do work by providing appropriate training to personnel assigned key responsibilities within these plans, and by instituting a program of regular tests and exercises. Much can be done to prepare *now* before the next great earthquake strikes Orange County.

An Assessment of the Consequences of a Catastrophic Earthquake in Southern California

While current response plans and preparedness measures may be adequate for moderate earthquakes, federal, state and local officials agree that preparations are woefully inadequate to cope with the damage and casualties from a catastrophic earthquake, and with the disruptions in communications, social fabric, and governmental structure that may follow. Because of the large concentration of population and industry, the impacts of such an earthquake would surpass those of any natural disaster thus far experienced by the nation.

Estimates of Casualties

For estimates on injury, seriously injured, deaths and long-term homeless for both Southern San Andreas and Newport-Inglewood event scenarios, please refer to the excerpts from Orange County Earthquake Vulnerability Analysis.

[2]Information Taken From Orange County Emergency Plan, 7b.

Estimates of Property Losses for Representative Earthquakes[3]

Fault	Loss to Buildings ($ in Billions)	Loss of Contents ($ in Billions)	Total Loss ($ in Billions)
Newport-Inglewood (7.5)	45	24	69
Southern San Andreas (8.3)	11	6	17

The above figures represent losses in a 6 county wide area (Los Angeles, Orange, San Bernardino, Riverside, San Diego and Ventura Counties).

Excerpts from Orange County Earthquake Vulnerability Analysis

The scientific community considers earthquakes occurring along the San Andreas and the Newport-Inglewood faults to be the most significant events to be used by Orange County as a planning base. Because considerably different effects on Orange County will be realized by earthquakes occurring along these two faults, separate planning scenarios have been developed. Since planning scenarios are based upon assumptions, estimates, and projects, they should be used only as generalized models. For planning purposes, magnitudes of 8+ on the Newport-Inglewood fault are utilized.

Hazardous materials will present a major problem in the event of an earthquake along either the San Andreas or the Newport-Ingewood fault. Orange County, one of the largest industrial and manufacturing areas in the state, has more than 14,000 firms handling hazardous waste and produces an estimated 109,000,000 gallons of hazardous waste per year. Our highways serve as hazardous materials transportation corridors, and Interstate 5 is the third busiest highway corridor in the country.

San Andreas Event Scenario

The following estimate was prepared by USGS for Orange County in the Southern San Andreas event:

	9:00 am	2:30 am	2:00 pm	4:30 pm
Deaths	2,490-3,215	620	1,310	1,450
Seriously Injured	9,959	2,480	5,240	5,800
Injured	96,466	18,600	39,300	43,500
Long-term Homeless - approximately 2,000				

In the San Andreas event, Orange County is not expected to suffer physical damage or population vulnerability to the extent of surrounding counties; however, impact will be heavy. For example, the County's resources may be requested by the more heavily affected areas; and, the County may be requested to host displaced populations and serve as a staging and support area for resources moving to the more heavily affected areas.

[3]Prepared by: Federal Emergency Management Agency (FEMA) from analyses carried out by the National Security Council ad hoc Committee on Assessment of Consequences and Preparations for a Major California Earthquake

Approximately 900 hospital beds in Orange County are expected to be lost due to structural damage, leaving approximately 5,845 beds to serve those already hospitalized, in addition to those seriously injured during the event. It is estimated that more than 150,000 vehicles carrying more than 180,000 people commute from Orange County to Los Angeles County, and approximately 75,000 vehicles carrying 90,800 people travel from Los Angeles to Orange County on a typical work day. Therefore, an earthquake occurring during working hours would create major transportation problems for those displaced workers.

Loss of electrical power could substantially disrupt flight control operations and fuel pumping at airports within Orange County. Structural damage to control towers and terminals is anticipated. Also, loss of water could affect operations.

Radio systems will be 40-75% effective; and microwave systems will be 30% effective, or less. Orange County communications dispatch facilities, including Fire, Sheriff, and the EOC are located in areas of high shaking potential. Also, the primary communications tower, with microwave paths to remote facilities, is in a high risk area from both shaking and potential flooding.

Extensive damage is possible along the Santa Ana River drainage. Most of the river is within a liquefaction area from the Ocean to 5th Street, from Katella to Lakeview, and from Lakeview to County limits. If Santiago Creek Dam is at capacity level, heavy shaking could cause extensive damage. Pump stations at Cypress, Huntington Beach, Los Alamitos, and Seal Beach are expected to fail due to liquefaction.

Five major power plants in the Long Beach-Huntington Beach area are expected to sustain damage due to liquefaction. Loss of Southern California Edison transmission lines in the northeast area of Orange is possible. A reduction of approximately 25% output is expected due to loss of fuel caused by transmission piping damage and/or curtailment of natural gas supplies.

Nine of Orange County's fire stations are in zones of high liquefaction potential, and five are in a moderate liquefaction potential zone. Three stations are located near potential ground failure areas.

The 55 Freeway overpass at Lincoln Boulevard has the potential to collapse, obstructing the 55 Freeway, as well as Lincoln Boulevard. Santiago Boulevard, from Robin Hood Road to Anaheim city limits, could be impassable due to ground failure. Pacific Coast Highway could be closed at the Santa Ana River and Anaheim Bay. The 405 Freeway could be closed or disrupted due to multiple problems.

Pressure-actuated cut-off valves are likely to minimize gas loss, even though six of the eight natural gas pipelines serving Southern California cross the San Andreas fault and are presumed to rupture; however, damage to pumping stations may affect gas transmission.

Since most major petroleum pipelines cross the San Andreas fault, pipeline breakage is expected. The possibility of fire exists wherever pipeline failures occur. A fire hazard could be presented by the high potential for rupture of the 700 psi jet fuel line strapped to the Santiago Creek Bridge on Glassel Street in Orange.

Connecting rail facilities serving major ports in the Long Beach area may sustain damage that will curtail port operations. Loss of electrical power could eliminate the use of sophisticated cargo handling equipment. The rail system in the Wilmington-Long-Beach-Seal Beach harbor areas will sustain considerable damage due to localized ground failure. The Atchinson, Topeka, and Santa Fe (ATSF) line will be subjected to localized ground failure from Placentia to the Riverside County line, along the Santa Ana River, through Santa Ana Canyon. Union Pacific and Southern Pacific lines, along San Jose Creek south and west from Diamond Bar to the West Whittier area will experience localized track outages in areas of high water. Collapse of the ATSF Railroad bridge across Chapman Avenue, parallel to Interstate 5 is probable. It is expected that 21 of 59 route segments serving Southern California

will be unavailable for post-earthquake service. The only railroad access to Orange County would come via San Diego, using the San Diego and Eastern Arizona and the Tijuana and Tecate. Both of these lines are aging, and it is unlikely that they could ever support more than two or three trains per day.
There is a limited volume of storage available in waste water treatment plants. If the plants cannot be restored before storage is exceeded, the waste water will require discharge with emergency chlorination in order to reduce health hazards. Sewer line breakage is anticipated in the older area of Orange and throughout northeast Orange.

In the western portion of Orange County, the telephone system will lose approximately 85% of its capability, with its effectiveness rising to approximately 40% by the end of three days. In the eastern portion of the County, the system will lose approximately 80% of its capability, but will regain approximately 60% of its capability within three days.

It is expected that power will be lost at the Diemer Filtration Plant, near Yorba Linda, limiting the facility to gravity flow. Ruptures are expected to occur along regional water pipelines, including the Tri-Cities and Aufdenkamp mains east of the coastal junction.

These failures would cut off the imported water supply to South County for about five days. Anticipated damage to the East Orange County Feeder may reduce its normal capacity to 20%. The imported supply to the southwest portion of the County would be cut off by a rupture of the West Orange Water Board Feeder, and repairs could take a minimum of one week. Loss of power will disable a majority of water wells in Orange County. Also, shear forces will render approximately one-third of the County's water wells inoperable for an indefinite period of time.

Newport-Inglewood Event Scenario

The following estimate is from 1980 NOAA projections, based upon population increases through 1980:

	2:30 am	2:00 pm	4:30 pm
Deaths	950	2,060	2,265
Seriously Injured	3,800	8,240	9,060
Injured	28,500	61,800	67,950

Long-term Homeless - 51,000 to 89,000

In the Newport-Inglewood event, Orange County is expected to suffer heavy damage to all primary utilities, buildings, transportation, and communications facilities. Liquefaction in the north and west area of the County is highly probable and, when combined with the intensive shaking, can contribute considerably to overall damage.

Hospital bed loss in Orange County is expected to be 43.5% for the Newport-Inglewood event. The estimated number of hospital beds in the County is 6,745. Given the loss, based upon the 43.5% estimate, the number of remaining beds would be 3,811. The disparity between beds available and the seriously injured will create an unprecedented medical emergency that can only be resolved by an immediate influx of emergency medical aid and/or the export of the seriously injured to out-of-county facilities.

The Los Angeles International, Long Beach, and John Wayne Airports, and the Los Alamitos Reserve Center and El Toro Marine Air Station are all located within 10 kilometers of the fault. All of these airports are likely to sustain runway damage sufficient to keep them temporarily out of service. Also, damage to control towers, fuel tanks, and other structures is expected. Loss of electrical power will affect tower operations and fuel service pumping.

Gas service to major coastal power plants is likely to be disrupted. Damage to the Scattergood, El Segundo, Redondo Beach, Harbor, Long Beach, Alamitos, Haynes, and Huntington Beach Power Plants may be extensive. The Harbor, Long Beach, Haynes, Alamitos, and Huntington Beach plants should be considered at 50% of their capacities for 30 to 60 days. It is wise to assume that, for at least the first 72 hours, there may be no commercially available electrical power. A 1973 NOAA study indicated damage to 5,800 distribution transformers and interruption of 16,700 circuits within Orange County from the Newport-Inglewood event. As a result of population increases, these numbers are substantially greater now.

The potential for fire is at least 15-20% greater, and more damage is expected to County water distribution systems and fire stations than in the San Andreas event. There is also a considerable fire potential in the harbor areas.

Portions of freeway routes in Orange County will be unusable for at least two weeks; and 25% of the major surface streets in the vicinity of freeways will be blocked due to collapsed overpasses. Many surface streets will be blocked by debris from buildings, fallen electric wires, and pavement damage. Landslides will block many roads in the hills and mountains. Damage will be most severe along Pacific Coast Highway (PCH) between Long Beach and Newport Beach, where it will be affected by failure of bluffs and liquefaction. Soil failure is expected to occur where PCH crosses marsh land at Seal Beach.

Port facilities at Los Angeles and Long Beach should be considered 100% out of service for three days, 80% for seven days, and 50% for an indefinite period. Harbor waters will be contaminated by ruptured sewer lines. Broken petroleum and natural gas pipelines will create fire hazards within the ports. At Seal Beach, the fault is within two kilometers of the coast.

A NOAA study estimates 1,200 breaks in natural gas mains; and, services and 53,600 customers in Orange County will be affected. Since the study, these figures are substantially higher due to increased connections and population.

Some harbor waters will be covered with leaking petroleum products due to pipe damage. Fire is a serious threat if leaking products are ignited.

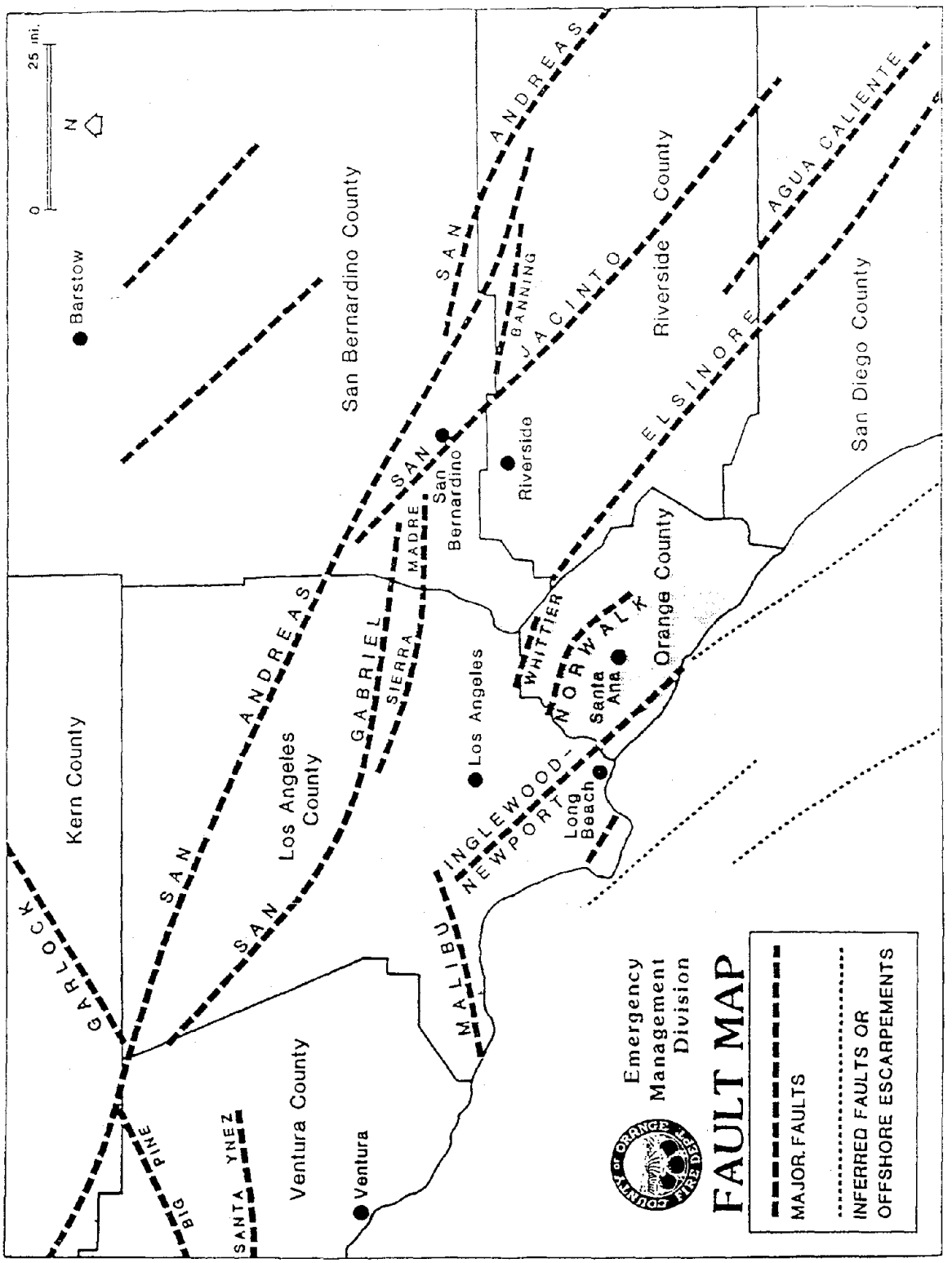
Of the 59 rail route segments, 31 will be unavailable for service. The ATSF route between Orange and San Diego will be closed by ground failure near San Clemente.

Several areas will be subject to landslide. Many rail bridges are susceptible to damage because of age, design, and construction. Seven railroad route segments cross the fault where surface rupture can be expected.

All Orange County water and waste treatment facilities are subject to heavy damage due to intense shaking or liquefaction. Operations may be interrupted for an indefinite period due to damage and loss of electrical power.

Telephone service to the entire Orange County area may be totally disrupted for some time due to the intense shaking, liquefaction and system overloads.

Lengthy disruption of bulk water supply systems will force dependence on local supplies from wells and storage reservoirs; however, damage to wells and treatment and distribution systems in heavily shaken and poor ground areas will prevent distribution of potable water to residents in these locations. The quantity of available stored water will depend upon the amount of rainfall and the time of year. Supplies could be further reduced by damage to dams and supply conduits from more distant reservoirs. Supplies from wells will be contaminated due to electrical power outages, damaged equipment and contamination from ruptured sewer lines. Repairs to the distribution system may take months, since repair crews will not be able to initiate work until the threat of aftershock subsides and above-ground debris is removed.



From: Orange County Emergency Plan, April, 1987, Part One, Appendix 1, Attachment A, p.113.

Evaluating Other Hazards in Your Area

By Robert G. Berg
Emergency Services Coordinator
City of Anaheim

HAZARD ANALYSIS PLANNING CHECK-LIST

IDENTIFY YOUR AREA OF RESPONSIBILITY
ie. School site, number of children,etc.

IDENTIFY THE HAZARDS IN YOUR "IMMEDIATE" AREA
School in industrial area, Haz Mat plant near by, next to transportation corridor, in a flood plain, etc.

IDENTIFY HAZARDS THAT COULD AFFECT YOU...
Chemical plant, up-wind, near a flight corridor, major earthquake fault in the area, Santa Ana wind conditions

ASSESS THE VULNERABILITY ON YOUR FACILITY, STUDENTS
Immediate - life threatening, sheltering, evacuation requirements, long-term, sustained operation needs

IDENTIFY RESOURCES AVAILABLE, AND NEEDED
Materials on hand and immediately available. Materials in the area, and out of district.

ANTICIPATE LONG-TERM REQUIREMENTS, AND THE IMPACT THE HAZARDS WILL HAVE ON YOU OBTAININGTHESE RESOURCES.
Food, water, medical supplies, cots, sanitation supplies etc.

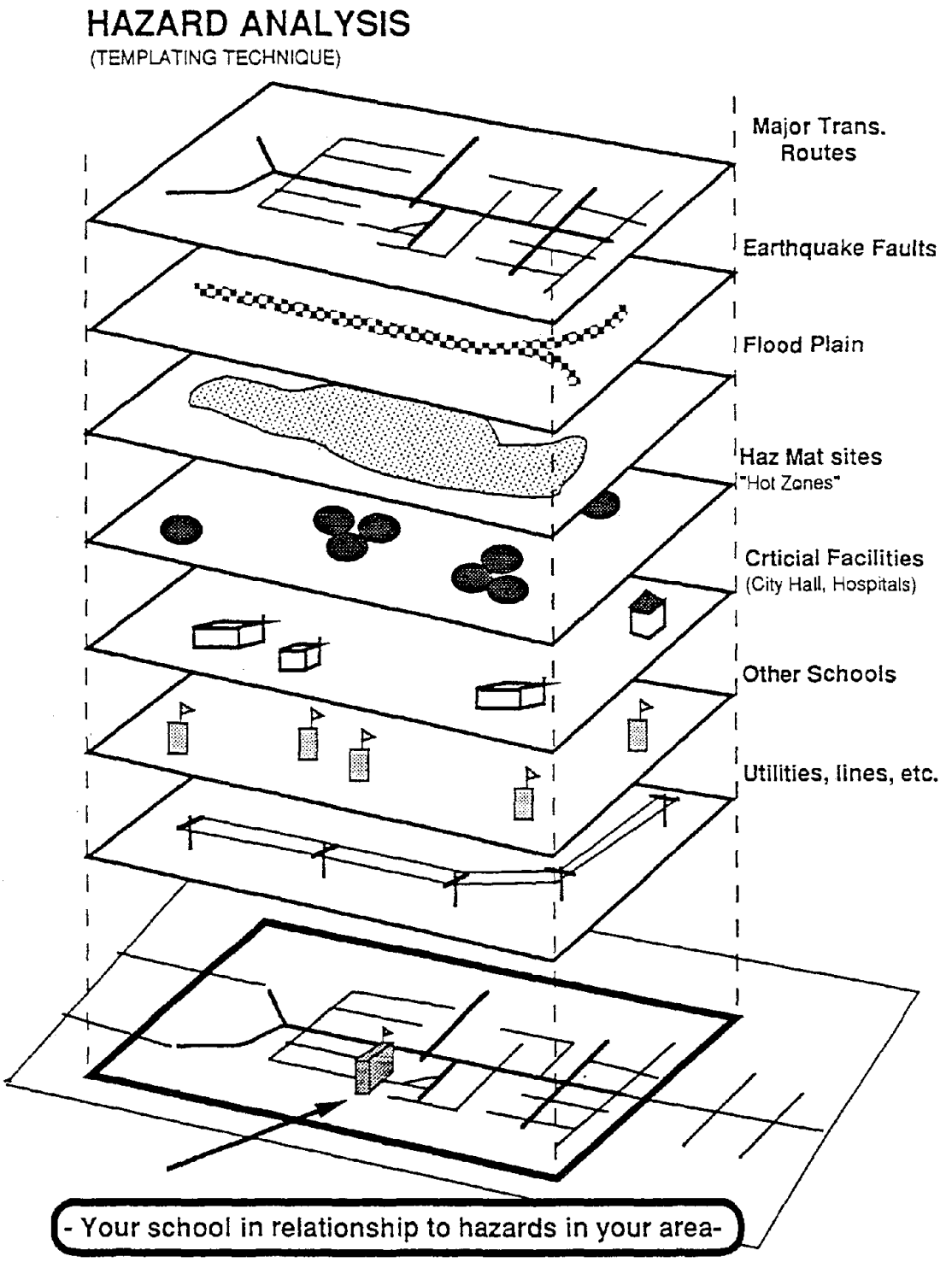
HAZARD ANALYSIS

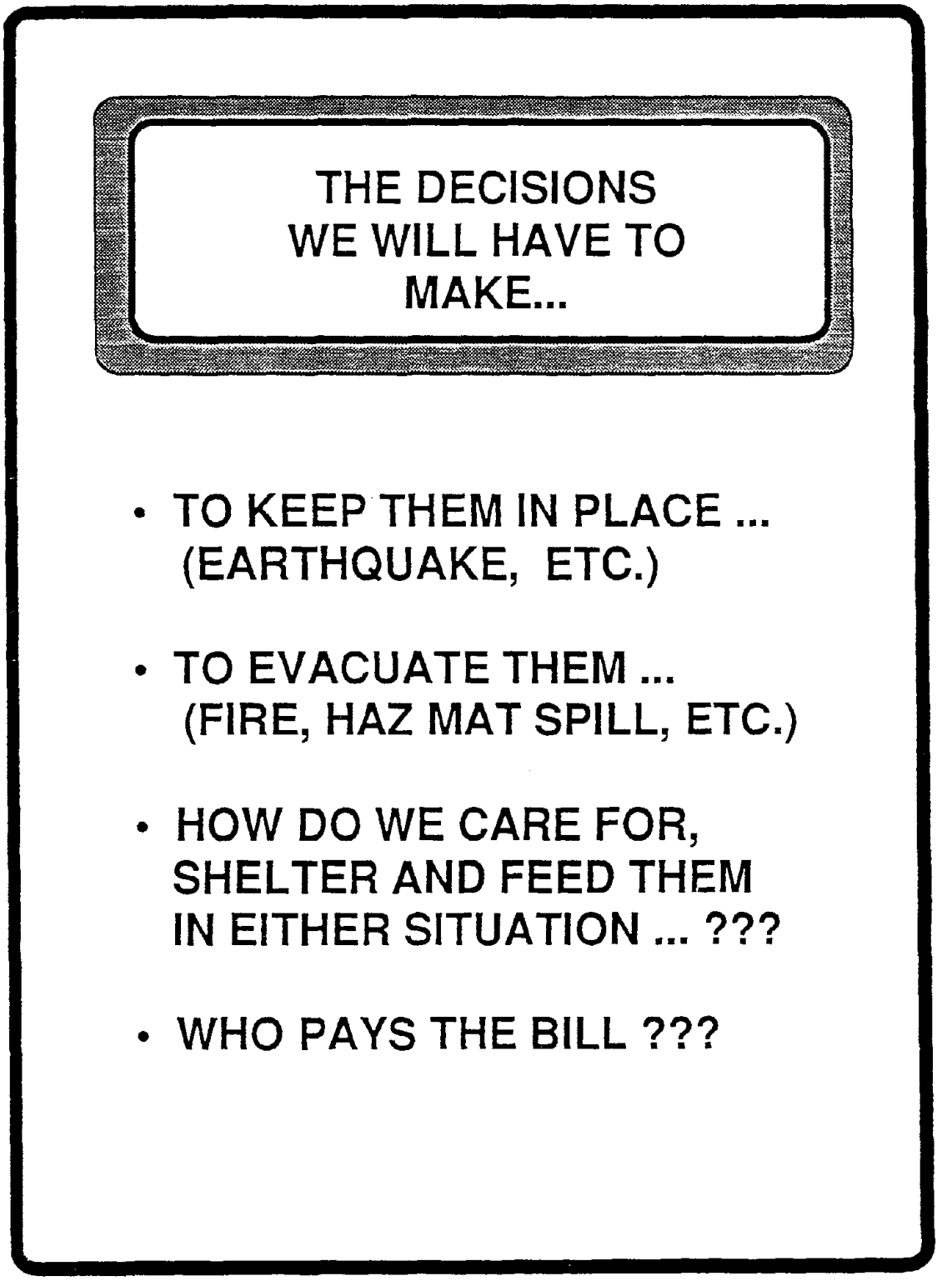
This is a comprehensive list of the different types of natural, technological and environmental disasters that have and could confront us in Southern California.

NATURAL HAZARDS	History	Potential
Earthquakes	☐	☐
Excessive rains	☐	☐
Flooding	☐	☐
Dam Failure	☐	☐
Windstorms	☐	☐
Tornadoes	☐	☐
Hailstorms	☐	☐
Snow Storms/Cold weather	☐	☐
Drought	☐	☐
Wildland Fire	☐	☐
Lightning	☐	☐
Landslides	☐	☐
Tidal waves	☐	☐
Volcanoes	☐	☐
TECHNOLOGICAL HAZARDS		
Fire	☐	☐
Hazardous Materials spills	☐	☐
Nuclear/Radiological accidents	☐	☐
Medical/Health/Epidemic	☐	☐
Civil Disturbance/Terrorism	☐	☐
Communication systems failures	☐	☐
Utility systems disruptions	☐	☐
Transportation systems disruptions	☐	☐
ENVIRONMENTAL HAZARDS		
Air Pollution	☐	☐
Water/Food Pollution	☐	☐
Weather conditions	☐	☐

ELEMENTS OF A HAZARD VULERABILITY ANALYSIS

- PREDICTABILITY
- FREQUENCY
- CONTROLLABILITY
- DURATION
- SCOPE
- INTENSITY OF IMPACT


HAZARD ANALYSIS
(TEMPLATING TECHNIQUE)
Major Trans. Routes
Earthquake Faults
Flood Plain
Haz Mat sites
"Hot Zones"
Crticial Facilities
(City Hall, Hospitals)
Other Schools
Utilities, lines, etc.
- Your school in relationship to hazards in your area-


THE DECISIONS
WE WILL HAVE TO
MAKE...
• TO KEEP THEM IN PLACE ...
(EARTHQUAKE, ETC.)
• TO EVACUATE THEM ...
(FIRE, HAZ MAT SPILL, ETC.)
• HOW DO WE CARE FOR,
SHELTER AND FEED THEM
IN EITHER SITUATION ... ???
• WHO PAYS THE BILL ???

Non-Structural Hazard Mitigation for Schools

By Frances E. Winslow, Ph.D.
Emergency Management Coordinator
City of Irvine

Some earthquake preparation takes a lot of time. Some takes a lot of money. Some requires the cooperative action of large groups of people. Effective non-structural hazard mitigation can be begun by one person, at little or no cost, in a few hours.

What does this complicated phrase, **non-structural hazard mitigation**, mean? Non-structural hazards are those items which have been placed in a building which have the potential for damage, death, or injury in an earthquake. Furnishings and teaching materials fall into this category for schools. The school buildings have been built to high seismic safety guidelines ever since the Long Beach earthquake of 1933. The Katz Act of 1984 mandated further actions to enhance student and staff safety before, during and after an earthquake. Non-structural hazard mitigation is a part of the mandate of the Katz Act.

Non-structural hazard mitigation starts with a survey of your facility. What items are potentially hazardous? The colored chart in your packet contains a list of common non-structural hazardous. In your own classroom you may have a file cabinet, a computer, an aquarium, jars of paint, a microscope, a television and a videocassette recorder. All of these items are non-structural hazards. Tall thin items, like book shelves and file cabinets, tend to fall over in an earthquake. Large heavy objects with a lower profile tend to slide. This is why it is important to teach the students to hold on to the table or desk they are using for a shelter so they will slide with it!

Now that you have a list of the potential hazards, evaluate what action you can take to mitigate their level of danger to the students and staff. Some immediate actions will solve the simplest problems.

- Remove all items from the tops of storage shelves.
- Place the aquarium on a low table away from the student seating area.
- Move the file cabinet so it will neither fall on a person nor block the exit if it falls over.
- Put paint and chemicals in a cupboard on a low shelf.
- Move any heavy teaching equipment to a low shelf.
- Place audio-visual equipment on the floor.

Spending a little money can achieve a higher level of safety.

- All bookcases should be bolted to the wall with an angle bracket and 2 inch lag screws into the wall studs.
- Shelves should have either a lip installed along the bottom edge, or a strap or chain secured at the mid-point of the shelf to prevent items from flying off the shelves and hitting the occupants of the room.
- Paint and chemical storage containers should be made of plastic where possible. These should be stored in cabinets behind doors. Baby-proof latches should be used to keep cabinet doors closed. This allows the door to be opened partially, and a piece of cardboard inserted to push the bottles back on the shelf after an earthquake.
- Gas cylinders may be found in chemistry labs or maintenance areas. These should be secured with a chain or nylon belting at the top and the bottom.
- Audio visual aids pose a special problem. While they need to be secured, they also need to be portable. The best solution is to affix them permanently to an audio-visual cart, either with metal bolts and brackets, or with Velcro. Velcro allows for easy removal for servicing, while securing the item in an earthquake.

The Palm Springs Fire Department reported that a typewriter flew across a home office and embedded itself in the wall at waist height during their 6.5 earthquake. They estimated that it was traveling at 45 mph!

- All typewriters, computers, monitors and shop equipment should be secured with Velcro or bolted in place. People often think that if an object is heavy it will not move in an earthquake. Consider how heavy the buildings and bridges are in San Francisco, and they certainly moved!
- School water heaters are often found in out-of-the-way places like closets or storage areas. Don't over look these! If the water heater falls over, it will snap the gas line. As gas leaks there is the potential for explosion and fire. Water heaters should be secured at the top third and bottom third with plumber's tape and 2 inch lag screws into the studs.

Decorations in the class room may also pose a problem.

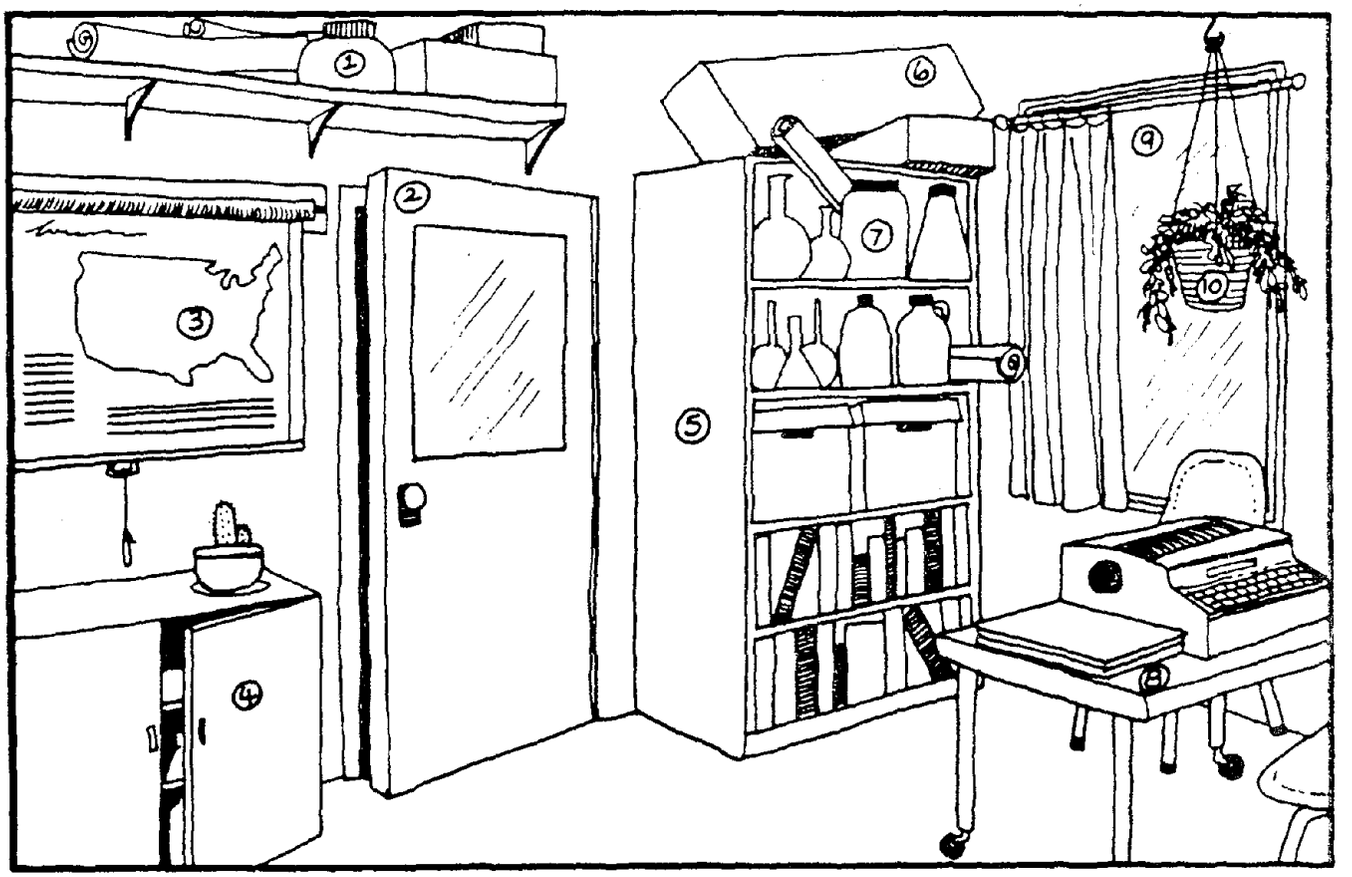
- Plants should be removed from high shelves. Plant pots should be velcroed in place.
- Hanging plants should be secured so they cannot swing. Hooks for hanging plants should be squeezed closed. Never allow people to sit under the potential arc of a hanging plant.
- Pendulum lamps should be removed if possible.

Some non-structural hazard mitigation needs to be undertaken at the district level. Because there is a larger cost involved, it is best accomplished in a systematic way. For example:

- The school district could perform a safety inspection on all overhead lighting to be sure that the fixtures are attached firmly to the structural members of the building, not to the false ceilings.
- Library shelving can be secured with an overhead system of channel strips. Shelves can be secured together and the units tied in at the wall. This system should be designed by an engineer and professionally installed. Alternatively, free-standing shelving can be bolted to the floor. This must be done professionally to assure that the bolts are attached to the beams of the building. Shelving that is against the wall can be secured with an angle bracket and 2 inch lag screws.
- All windows that are not made of safety glass should have protective filming applied. This film is available from the same vendors that provide window tinting. The film is similar, but has stronger adhesives and must be professionally applied.

CITY EMERGENCY-MANAGEMENT SECTION
(714) 724-7149

LIVING SAFELY IN YOUR SCHOOL BUILDINGS



TEN HAZARDS COMMON TO ALL SCHOOL BUILDINGS

A PLAN FOR REDUCING NON-STRUCTURAL EARTHQUAKE HAZARDS AND HELPING YOU IMPROVE "EARTHQUAKE AND EMERGENCY PROCEDURES" IN YOUR SCHOOL

The "Plan" is a suite of activities to:

1. help school administrators organize their school community for inspecting and identifying non-structural hazards;
2. provide a plan for up-grading the safety of the school building;
3. provide the basis for establishing emergency plans and regular earthquake drills.

The "Plan" is based on two assumptions. These assumptions are:

1. Non-structural changes in school buildings and other decisions made regarding the use of the building can reduce earthquake hazards and risks.
2. The activities which accompany this brochure can enable an entire school community to live more safely in their school environment. The entire school community is encouraged to participate.

The activities are:

1. SURVEYING THE SCHOOL FOR NON-STRUCTURAL HAZARDS
2. DEVELOPING AN EMERGENCY PLAN FOR YOUR SCHOOL
3. EARTHQUAKE AWARENESS DRILLS FOR SCHOOLS

WHAT IS THE "PLAN?"

WHAT IS AN EARTHQUAKE HAZARD?

The recent earthquake in Coalinga (Richter Magnitude of 6.7) was a strong earthquake, but far weaker than the 8+ earthquake that scientists predict could shake many parts of California. Some effects observed as a result of the Coalinga quake were:

* Large windows were more likely to break. Large windows which break from earthquake motion can throw glass throughout the room and outside.

* Many fluorescent bulbs fell and many fixtures came down.

* In the third-floor chemistry laboratory at the high school, chemicals improperly stored together overturned and burned through to the first floor.

* Toxic fumes permeated the high school building from the reactions in the chemistry laboratory.

* File cabinet drawers opened and the cabinets toppled or slid. Latches did not hold.

* Typewriters fell or "were projected across the room."

* Some water pipes severed where they entered through concrete walls. Electrical supply and switching mechanisms in a basement were destroyed by water.

* Gas leakages occurred in schools, but no fires resulted.

* Cupboard doors sprung open, allowing chemicals and other contents to fall.

* Machine shop lathes and presses fell over.

* Storage cabinets attached with molly bolts fell over.

* Some T-bar ceilings fell.

* Bookcases, free-standing cabinets and miscellaneous shelving fell.

* Movie screens and maps became "projectiles."

* Extracted from, Robert Bulman, The Coalinga Earthquake - A Report on Schools, Office of San Bernardino County Superintendent of Schools.

HAZARDS FOUND IN COALINGA SCHOOLS AFTER THE EARTHQUAKE

AN EARTHQUAKE HAZARD IS SOMETHING WHICH CAN CAUSE BODILY HARM OR EMOTIONAL TRAUMA DURING AN EARTHQUAKE

Ten hazards commonly found in school buildings are:

1. Glass that shatters or "flies" into classrooms, halls, or stairways.
2. Objects that restrict people from moving to a safe place (books on the floor, tipped objects, broken glass, or open doors restricting movement in hallways).
3. Objects set on wheels (storage cabinets, carts with VCRs, computers or pianos).
4. Objects stored above head level (unused projectors, books, science equipment).
5. Cabinets without latches or latches which are not in use.
6. Open shelving without a shelf lip or restraining wire (chemical storage, food storage, or custodian supply storage).
7. Free-standing cabinets used for storage, such as books, musical instruments, athletic equipment or chemicals.
8. Exits that might be blocked (doors which could be blocked by unbolted furnishings that have tipped or slid).
9. Objects in hallways that hinder movement (tables, desks, storage cabinets).
10. The location of people with respect to earthquake hazards (students sitting near large windows with open shades, teachers seated under movie screens or in front of unlocked or unanchored cabinets).

Risk management is a major goal in making schools safe. It involves identifying non-structural hazards and then taking the necessary steps to reduce these risks.

HAZARDS COMMON TO ALL SCHOOL BUILDINGS

ESTABLISHING AN EMERGENCY PLAN AND REGULAR EARTHQUAKE DRILLS FOR THE SCHOOLS

The "Plan:"

Even the "safest" school building needs an Emergency Plan at the time of an earthquake. A plan, however, is only as valuable as the school staff's understanding of it and commitment to its importance. The following activities may be helpful in the development of your school plan.

1. "Developing an Emergency Plan for Your School:" this activity develops awareness of and concern for earthquake hazards amongst the administrative staff. It helps identify individuals responsible for setting up and carrying out the school's plan.

2. "Earthquake Awareness Drills for Schools:" this activity builds awareness of many earthquake hazards on the part of teachers, students and parents. This activity can be used to help motivate the implementation and maintenance of the school's emergency plan.

Regular earthquake drills are a basic part of preparedness - they are *actions* that promote safety for your staff and students.

ESTABLISHING REGULAR EARTHQUAKE DRILLS IN YOUR SCHOOL

REDUCING THE RISKS FROM NON-STRUCTURAL HAZARDS

Having identified the non-structural hazards at your school site, the next step is to determine the best way to mitigate these risks. There are many ways to accomplish this. Each of the following suggestions addresses a specific problem, but all require some kind of *action* on the part of school personnel.

* Change the location where people work relative to the identified hazards.
* Anchor bookcases and cabinets to wall studs.
* Relocate objects that might restrict movement to safety.
* Reshelve objects that might fall, placing lighter objects on the top shelves in the event that they do fall.
* Use wires or narrow boards to construct a "restraining wall" for open shelving.
* Put latches on cabinets.
* Check anchorage of all fixtures and grills in walls and ceilings.
* Mount fire extinguishers in accessible areas. Check anchorage of all existing fire extinguishers.
* Place chocks under wheels of pianos or other objects which move and are not equipped with built-in brakes.
* Store potentially hazardous or toxic substances to prevent breakage and mixing.

The outcome of the "Surveying the School for Non-Structural Earthquake Hazards" is useful in helping establish priorities for risk management of earthquake hazards in school buildings. This will help you set up a system to encourage the safe use of your school buildings in coming years.

REDUCING RISK FROM HAZARDS

PARENTS

DURING THE ACTIVITY: "Surveying the School for Non-Structural Hazards"

RESPONSIBILITY:

* Serve as members of the School Inspection Team, inspecting an assigned area for non-structural earthquake hazards.

* Participate in follow-up team discussions to determine which hazards should be addressed first and how.

EXTENDED ACTIVITIES:

* Provide leadership within parent organizations (PTA, for example) by acquainting school families with the school's emergency earthquake plan.

* Participate whenever possible in the schools' earthquake drills. See the Activity "Earthquake Drills for Schools."

* Develop a personal earthquake emergency plan for the family.

* Help school personnel prepare food and water caches and an emergency earthquake kit for each classroom.

SUGGESTED PARENTAL RESPONSIBILITIES

TEACHERS

DURING THE ACTIVITY: "Surveying the School for Non-Structural Hazards."

RESPONSIBILITY:

* Serve as members of the School Inspection Team (as a representative for the faculty).

* Establish a procedure for students to inspect their classroom for non-structural earthquake hazards.

* Encourage students to report their findings to the School Investigation Team, in a written or verbal form.

* Report to students the conclusions of the School Inspection Team and plans for mitigating identified hazards.

DURING THE ACTIVITY: "Earthquake Awareness Drills for Schools."

RESPONSIBILITY:

* Lead your class in its part of the drill.

* Hold a follow-up discussion to reinforce the ideas learned during the drill.

SUGGESTIONS:

* Assemble and maintain a classroom emergency earthquake kit. Include in the kit:

  1) list of students' names, phone numbers, who to call and any alternatives;
  2) medical information about students who might need special care;
  3) a first aid kit;
  4) name tags;
  5) the school district's emergency instructions.

* Regularly review first aid procedures.

SUGGESTED TEACHER RESPONSIBILITIES

School Preparedness Supplies and Student Emergency Comfort Kits

By Frances E. Winslow, Ph.D.
Emergency Management Coordinator
City of Irvine

If a disaster strikes while the children are at school, will your school be prepared to care for them? If the children need to remain at school for several days, are you prepared?

Many schools have requested parent participation in preparedness. Each child has been asked to make a comfort kit at home that he can leave at school from September through June. Schools should also have some preparedness items to assure the safety of all students, faculty and staff. It is important to provide guidelines to parents on what to include in the backpack, and to let the parents know what items the school has provided.

If funding is a problem, work with the PTA. The safety of the children is paramount, so emergency preparedness items deserve serious consideration in the PTA school gift budget. The local government may be able to assist the school district in developing a cache of basic supplies to be augmented by local efforts. The district should make emergency preparedness a priority, as well.

School Emergency Supplies

The following is a list of basic emergency preparedness supplies that every school should have.

1. Water
2. First Aid Supplies
3. Rescue Supplies
4. Principal's Supplies includes a bull horn, a whistle, an up-to-date list of students, faculty and staff, a supply of student release forms, rope, tarpaulin and cord, a lantern, a roll of plastic sheeting.
5. Classroom Supplies includes a flashlight and a battery-operated portable radio.
6. Sanitation

Student Backpack Supplies

1. Food
2. Clothing
3. Medical Items
4. Psychological Care Items, i.e., a blanket, stuffed toy or similar security item should be included for every child in the elementary school.

Emergency Supply Storage

Modern schools seldom have adequate space for storing the needed emergency supplies. Consider asking the PTA to purchase a storage shed for your property. It is a good idea to have the emergency preparedness items away from the building. Alternatively, a used sea-going cargo container may be purchased for under $3,000 at most ports and many railroad yards. A local business might donate a storage container that they no longer need.

Computers and Clip Art: Getting the Earthquake Preparedness Message Across at a Reasonable Cost

By Frances E. Winslow, Ph.D.
Emergency Management Coordinator
City of Irvine

A picture is worth a thousand words ... especially if the picture is funny! Earthquake preparedness information can be frightening to little children. The idea of the "solid ground" moving beneath their feet may be too difficult to comprehend. However, young children must not be overlooked in earthquake preparedness education.

Is Duck and Cover Funny?

The message to the very young is: duck and cover, call out your location, never hide. These are behaviors that should be emphasized from the time children learn to walk. Day care providers and pre-schools should make a game of proper earthquake behavior among the early years group, and hold drill competitions among the 4 and 5 year olds to inculcate the importance of proper earthquake behavior.

Materials to reinforce proper earthquake behavior are more acceptable if they appeal visually to the child. Cartoons, animal drawings or comical illustrations are techniques that advertisers use to entice people of all ages to alter behavior to favor certain products. The Snuggle bear, the Morton Salt girl and the Hush Puppies trademark blood-hound are good illustrations of this technique. The success of this style of marketing is best demonstrated by the Spuds McKenzie commercials that so appealed to youngsters that elementary school youngsters were clamoring for sportswear featuring the charming canine. These commercials have been withdrawn because of their strong effect on the younger children.

Animals: Whimsical Earthquake Educators

Earthquake preparedness educators may use this technique to good advantage. Develop educational materials featuring a mascot animal, preferably one who is whimsical or comic. The City of Irvine staff realized that in order to draw attention at public events they would have to develop a "handout" item with appeal to young children. Stickers were a popular collector item among the young in the 1980's. The staff developed a slogan that carried the important message to "prepare for the quake," but attached it to a catch phrase. The result was a concept for a round sticker with the slogan "Don't Monkey Around, Prepare for the Quake." The hunt was on for the monkey to "star" in this promotion.

Professional cartooning is a fine art form practiced by few individuals. They receive compensation commensurate with their unique talents. It is not unusual to pay $300 or more for the creation of a unique character. A more reasonably priced alternative is the use of a book of "clip art" with pages of pre-drawn illustrations. Such books are sold at stationary stores, copy centers, and printers' supply outlets. Irvine's staff lacked the funding to support the development of a unique monkey for the sticker. However, a clip art book provided an illustration of a complacent looking gorilla holding a banana. A little stretch of the imagination changed the banana into the state of California with its faults showing. The resulting sticker is the logo for the Emergency Management program, and is featured at all public events, on publications aimed at a younger audience, on balloons, on stickers, and on the masthead of the division's column in the Irvine World News newspaper.

Picture Books From Computer Graphics

Young children enjoy picture books. Early readers enjoy books with a few words per page. Early elementary children like coloring books. Simple versions of these types of materials can be made in-house with the aide of a computer and a graphics program. Only a few words are needed on each page, conveying the central ideas of earthquake preparedness for young children. An attractive illustration featuring an animal with a plausible connection to the advice will add appeal. For example, to illustrate the concept "stay indoors," you can use a camel sitting inside a tent, a dog in a dog house, or a cow in a barn. Simple graphics programs are available that will include a wide variety of animals - zoo animals, farm animals, or domestic animals. The book can be based on any animal such as these: Old McDonald's Farm, Zoo Friends, Jungle Friends.

When designing a book for older children, include games and puzzles that reinforce information obtained from the book. A magic maze that spells out an earthquake tip will appeal to the younger elementary set. A crossword puzzle focusing on earthquake preparedness supplies will appeal to the older elementary children. A "hidden picture" puzzle with earthquake supplies worked into the design of a house, or a magic code message will appeal to most elementary children. Such puzzles can be easily made freehand. Commercially available children's activity books show the range of reinforcement activities that can be created. Puzzles with a message are a powerful way of teaching elementary children.

Purchasing Software

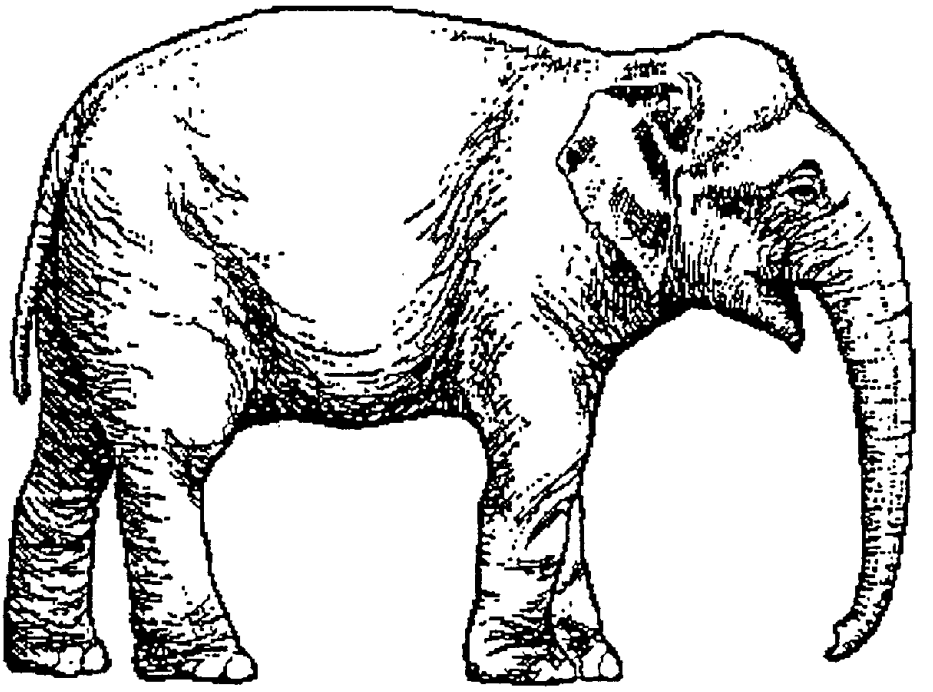
When purchasing the graphics software for illustrating the books, carefully read the copyright. Some software has been developed for use in commercial enterprises such as fliers, business promotions, and advertising materials. This copyright will generally require that the copyright holder be acknowledged in the publication. It is a good idea to devote the back page of your publication to acknowledging the author and the source of the graphics, as well as any sponsor for the printing. However, the purchase of the software usually includes a license for the purchaser to use the graphics for public display or distribution. Alternatively, the license for use may be worded without mention of usage limitations.

Some other graphics software - especially that which features well-known commercial cartoon characters - will carry restrictions against "public distribution." Avoid purchasing and using these. Even though there is no profit involved in the creation and distribution of your earthquake safety information, the owner of the copyright on the animals may sue for infringement. The City of Irvine could not use two computer graphics children's pieces from Disney Studios, due to copyright infringement.

Power in the Picture

Combine your creative efforts with the illustration assistance of a computer software package for greater flexibility in creating earthquake education materials. Graphics packages offer the opportunity to change the size of the animal, change the orientation, and add accessories or other animals to the illustration. Rely on clip art to illustrate single subject pieces. Consider modifying commercial drawings with simple additions to tie the illustration to a particular locale. A picture is really worth a thousand words. Use clip art and computer graphics to multiply your teaching power.

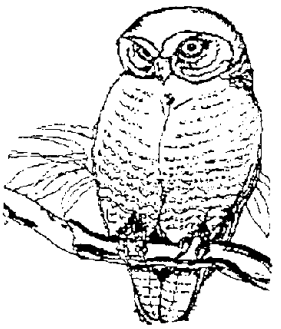
ZOO FRIENDS

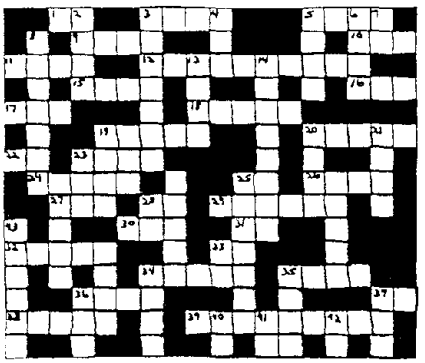


EARTHQUAKE SAFETY ACTIVITY BOOK

JUMBO SAYS: "HAVE YOU LEARNED YOUR EARTHQUAKE LESSONS? IF YOU CAN SOLVE MY PUZZLES, YOU ARE AWARE AND PREPARED!!"

EARTHQUAKE CROSSWORD





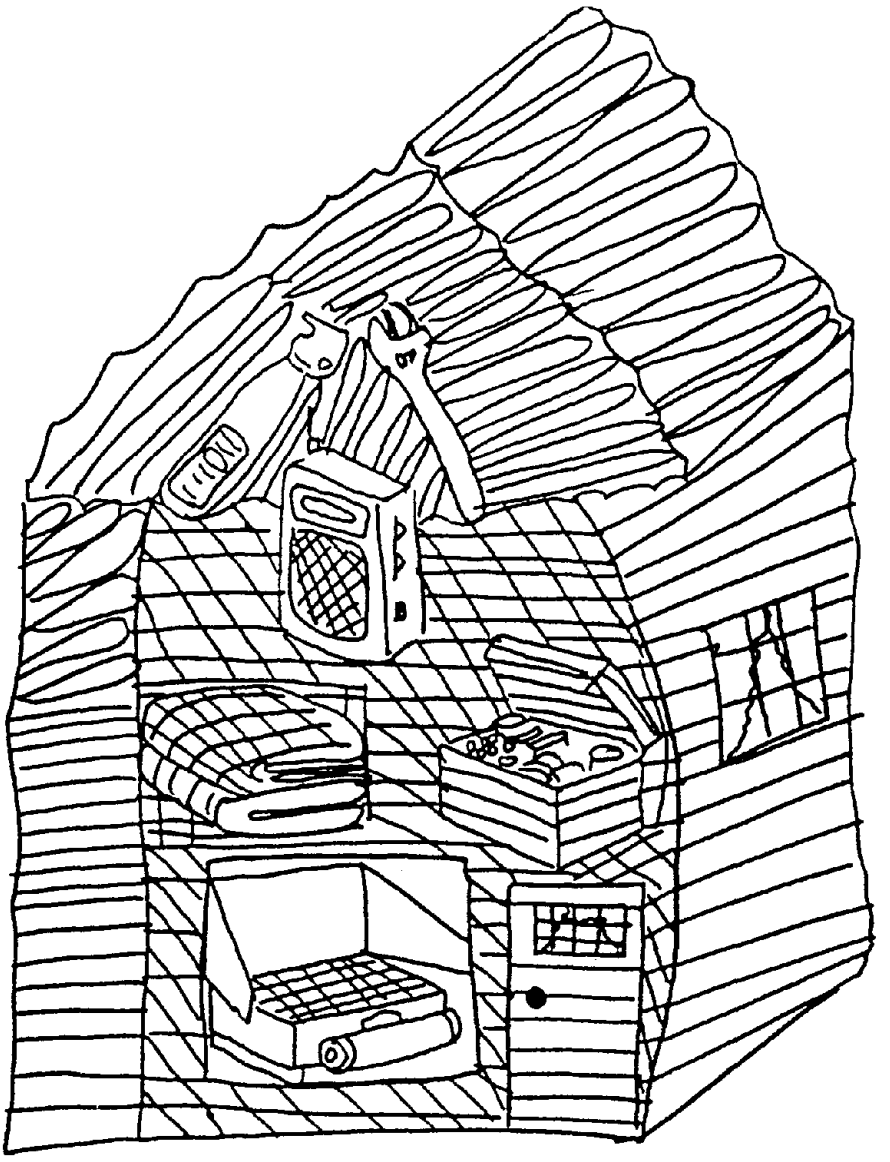
ACROSS

1. United States __ America
3. Deciding what you will do
5. Frozen rain
9. Smell
10. Automobile
11. Opposite of "out of"
12. When the Earth's plates shift
15. Rain___
16. What's up,___?
17. He ___ the race
18. Worn on the feet
19. Primary
20. San Andreas _____
22. Either
23. Bee's home
24. Tale
25. Prefix, meaning two
26. Danger
27. Past tense of eat
28. Short for hello
29. Mittens
30. What groceries are put in
31. A grape, __ apple
32. You listen to the emergency broadcast on the ____
33. A pear, ___orange
34. To pile up, as blocks
35. You use these to see.
36. Videotape is VHS or ____
37. Dates are either BC or____
38. In an earthquake, duck and _____
39. These power your flashlight

DOWN

2. What you eat
3. To be safe in an earthquake, you must ____
4. Squirrels store this
5. Top of the body
6. ____ tea
7. 5th note of the scale
8. Where you should stay in an earthquake
13. Wet iron makes ____
14. Opposite of answer
19. _____ extinguisher
20. Your ____ place can provide heat
21. An inland body of water
23. Opposite of cold
25. You wrap up in this to keep warm
28. A short laugh
33. Electric current is either DC or _____
34. Without danger
35. Opposite of odd
36. Where you sleep
37. What you do to a question
40. Cold ___ ice
41. Toward
42. Opposite of out
43. Tool to shut off gas

The Ready Residence

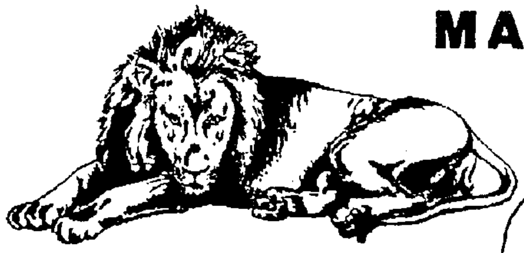


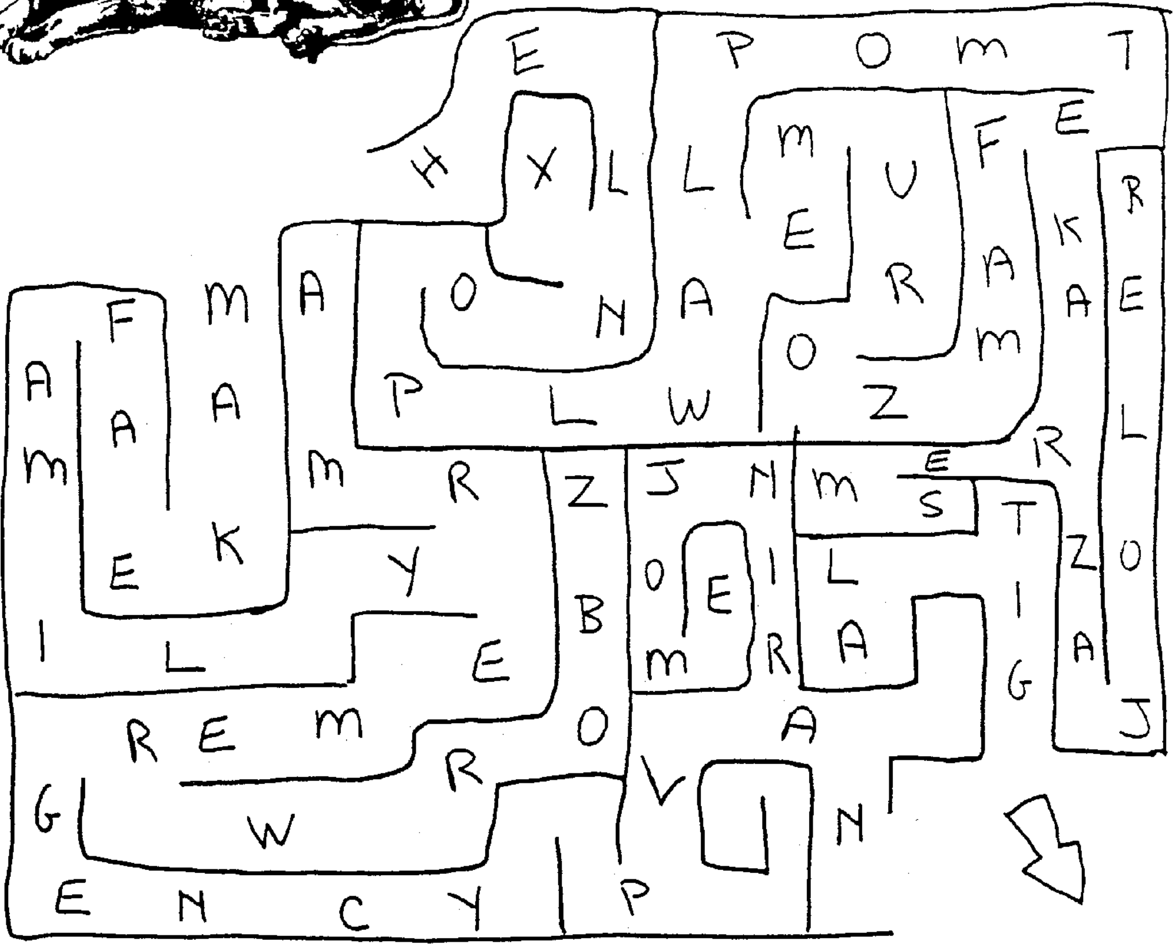
This family is prepared for an earthquake. Can you find the supplies that they have stored?

Fire Extinguisher	Blanket
Wrench	Portable Stove
Radio	Food and Medical Supply Kit

Circle the objects when you find them, then color them.

MAGIC MESSAGE MAZE



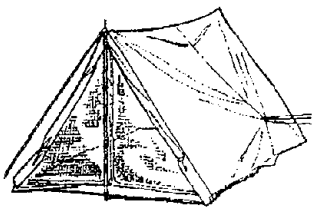


PREPARED!!

DISCOVER THE RIGHT PATH, YOUWILL FIND A SECRET MESSAGE THAT WILL HELP YOU BE PREPARED FOR AN EARTHQUAKE! FILL IN THE LETTERS ON THE LINES BELOW TO REVEAL THE MAGIC MESSAGE.

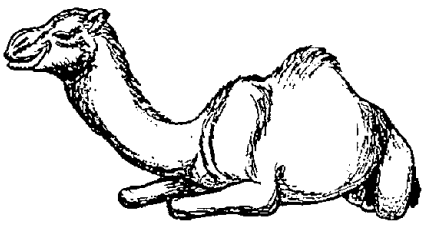
_ _ _ _   _   _ _ _ _ _ _ _

_ _ _ _ _ _ _ _ _ _ _   _ _ _ _



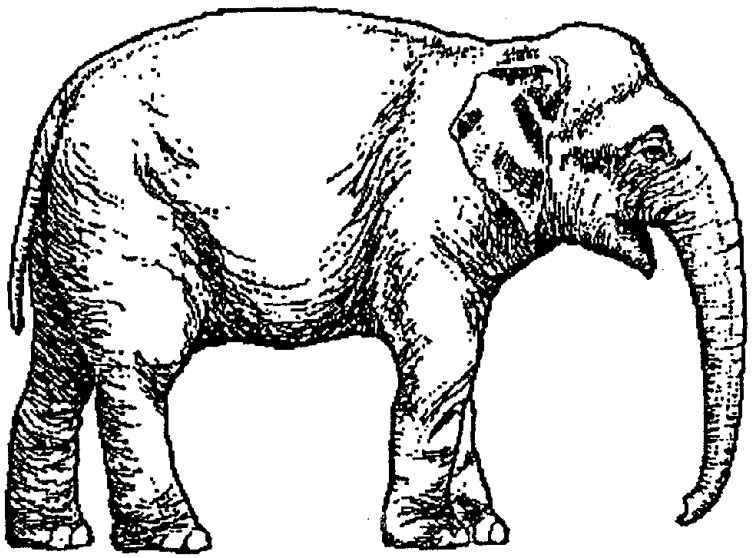
EARTHQUAKE

WORD-FIND



D B X Z Y L P R O T A B L E
E O R T Z B R M N O P Q R S
S U P P L I E S A B R D X Y
K M P R S T P A B C E U T F
C D F O O D A L W A X C O F
A B A T T E R I E S B K A L
Z L U M A F E B A A L G E A
R A L L R G C U R T A I N S
L N T O O L S C T C M H U H
P K A B L E L E H E K J I L
A E U C K H M G Q G E L O I
M T X O X I N I U I T M E G
E S Y V W J O W A T E R I H
V K W E Z K P J K K B Q B T
A B L R S H A K E M D Z D S

BATTERIES
BLANKET
COVER
CURTAINS
DESK
DUCK
EARTHQUAKE
FAULT
FOOD
FLASHLIGHTS
PREPARE
SHAKE
SUPPLIES
TABLE
TOOLS
WATER



JUMBO'S

IMPORTANT MESSAGE FOR YOU.

IT IS HIDDEN BELOW.
BUT IT IS IN CODE!
REPLACE EACH LETTER
WITH THE LETTER THAT
COMES AFTER IT IN
THE ALPHABET, EXCEPT
Z STANDS FOR A!

JDDO BZRG HM XNTQ

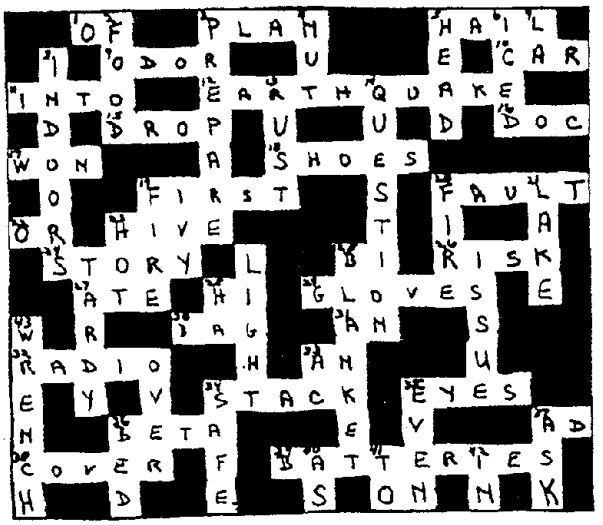
_ _

DZQSGPTZJD JHS

_ _

ANSWER PAGE

CROSSWORD PUZZLE



Magic Message Maze Solution:

Make a Family Emergency Plan

Jumbo's Important MESSAGE

Keep Cash in Your Earthquake Kit

EARTHQUAKE WORDFIND

D	B	X	Z	Y	L	P	R	O	T	A	B	L	E
E	O	R	T	Z	B	R	M	N	O	P	Q	R	S
S	U	P	P	L	I	E	S	A	B	R	D	X	Y
K	M	P	R	S	T	P	A	B	C	E	U	T	F
C	D	F	O	O	D	A	L	W	A	X	C	O	F
A	B	A	T	T	E	R	I	E	S	B	K	A	L
Z	L	U	M	A	F	E	B	A	A	L	G	E	A
R	A	L	L	R	G	C	U	R	T	A	I	N	S
L	N	T	O	O	L	S	C	T	C	M	H	U	H
P	K	A	B	L	E	L	E	H	E	K	J	I	L
A	E	U	C	K	H	M	G	Q	G	E	L	O	I
M	T	X	O	X	I	N	I	U	I	T	M	E	G
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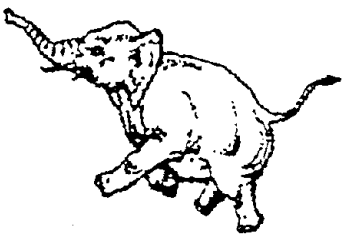

CITY OF IRVINE
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DESIGNED AND WRITTEN
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American Red Cross and Schools: Partners in Preparedness and Response

By Gordon Brown
Disaster Emergency Coordinator
American Red Cross, Orange County Chapter

Need for Communications

The key to an effective disaster response is the coordination of both people and material resources, within and outside the school system. To coordinate resources, school personnel need to communicate with each other and with other agencies such as the Red Cross.

Modes of Communication

Phones are the most ideal for point to point for they speak to a specific receiver and are confidential. However they are subject to overload and power failure.

Portable telephones overcome the weaknesses of traditional phones. However, they are slightly less confidential (for they are still radios) and they are expensive to operate although their purchase price is coming down. Radio telephone however, does not allow a message to be received at all stations at one time.

Commercial radios offer the most control of the airways although frequencies are becoming tough to obtain from the FCC. They also do not require any special license for each operator. However, purchasing a system is expensive. Many districts already have radio systems for bus coordination or other uses.

Amateur radio, also known as "ham" radio, has the advantage of free labor and radios with a wide variety of flexibility. However, it must be remembered that although radios can be used under controlled situations in the company of the licensed operator, the latter must be present, and the frequency will often have to be shared with other users.

Citizen band (CB) radio has very limited range and is overly crowded for any extensive, sophisticated use. However, it can be very useful in short range communication when there is few close-by other users to interfere. It can be used by anyone. It is the least disciplined radio service and is subject to interference.

Application of Communications

School systems have the need to conduct a number of types of communications to various levels. The following is a list of those communication channels and suggestions of the mode that would probably be most appropriate.

Intracampus: Within each campus, coordination of students, search and rescue teams, security, and damage assessment will require portable low power communications. This is the only level at which CB could be of use. Use of ham or commercial radio on "simplex" (radio to radio rather than relaying through a mountain-top remote control radio) could also be used. Runners can also accomplish this but are time consuming and perhaps dangerous for personnel.

Intradistrict: Each campus needs to be able to report to district headquarters about damage assessment, requests for medical assistance and supplies, and receive direction on policy issues. District resources need to be coordinated, reassigned, directed around hazards, able to report delays/problems encountered in the field, etc. Ham radio or radio

telephone could be used for campus to district and campus to campus. Commercial radio could do this as well as coordinate district resources. Ham could be used for district resources, but is somewhat impractical.

Interagency: The district will need to talk to outside agencies including the Red Cross, city emergency operating centers, etc. Most of these agencies will also be using ham radio so this is a viable alternative. However, some issues may need a more confidential method. "Packet" radio, a form of ham radio similar to using modems for computers, can transit data files such as documents, etc. to other agencies. It is somewhat more confidential, and very fast. This could also be used for Intradistrict.

Summary

Communications, like any disaster resource, are only as good as their back-ups. A matrix of several types of systems are needed not only to conform to the criteria listed above, but also to back-up each other should one fail or not operate effectively given a particular operation's conditions.

Working With Your City

By Jack Slota
Assistant City Administrator
City of Placentia

and Frances E. Winslow, Ph.D.
Emergency Management Coordinator
City of Irvine

Your local government has resources it can share with you. Members of your local government emergency preparedness staff can help you develop an appropriate supplies list for your school, can help you plan and execute a drill, and act as evaluators. They can speak to faculty and PTA meetings, and give guest lectures to students in science classes. They can help you write proposals for local business donations. They can also help you obtain additional information from federal and state emergency preparedness agencies, many of whom have school-related publications regarding preparedness. You can also work together to develop volunteer groups from the community to assist at the schools after an earthquake. American Red Cross trained shelter managers can be a buffer between the principal and the community members seeking assistance at the school because it is a "public building." Amateur radio volunteers can provide a communication link between the school and the local public safety agencies. Community groups might donate supplies or expertise to enhance your school preparedness program.

Plan and prepare ... then you'll be ready for California's faults!

"WORKING WITH YOUR CITY"
DISASTER PREPAREDNESS FOR SCHOOLS WORKSHOP
DECEMBER 4, 1989

CHECKLIST FOR DISTRICT COORDINATORS

1. Identify City or County jurisdictions serving each school site/facility.

2. Contact emergency coordinators serving each school in your District.

3. Coordinate Emergency Plans.

   - Determine procedures for requesting emergency responses during a disaster.

   - Participate in drills and exercises.

   - Determine emergency resource requirements and identify sources of supplies.

   - Develop damage assessment procedures.

   - Coordinate public information with local government PIO's.

4. Establish a District Emergency Operations Center.

   - Establish communications with local government EOC's.

   - Determine who can speak on behalf of the District.

5. Identify resources that can be shared.

   - Facilities (shelters, etc.).

   - Equipment.

   - Supplies (food, fuel, etc.).

   - Staging areas.

   - Personnel.

Part III

The Team Concept/The Buddy System

The Team Concept/The Buddy System

By Gloria Morrison
Emergency Services Coordinator
Huntington Beach Fire Department

Introduction

When earthquake plans are designed, every staff member at a school site must have an assigned role and responsibility. Because of the large number of students, limited on-site resources, and the unavailability of outside assistance, schools must become self sufficient! The following preparedness guides are designed to help schools become earthquake prepared by utilizing the team concept and buddy system.

Earthquake Preparedness for Schools

Experts tell us two things about earthquakes:

1. **It's just a matter of time** before we have a major earthquake on the San Andreas Fault. This will be devastating to Southern California.
2. **People should be prepared to take care of themselves for a minimum of 72 hours.** Police, Fire, and Paramedics will be overwhelmed with fires, rescues and extreme life threatening situations and they will not be available to respond to all your needs.

Should an earthquake occur during school hours, schools will be on their own and should be prepared to care for all children until they are released to parents or a responsible adult.

The Emergency Services Office of the Huntington Beach Fire Department is available, upon request, to work with the schools in emergency planning. We have disaster preparedness educational programs available for school staffs and parent teacher organizations. We can be reached at (714) 536-5980.

There are ten basic steps in disaster planning for schools. If you follow these simple steps, your school will be well on its way to preparing for any type of disaster. If you are prepared to deal with a catastrophic earthquake, you will be basically prepared for any type of disaster that may strike.

Appoint a Disaster Coordinator and Planning Committee

1. The committee should include the principal, a disaster preparedness coordinator, the school nurse and a representative from each of the following: the faculty, custodial staff, office staff and parent-teacher organization.
2. The committee is responsible for coordinating all aspects of disaster preparedness planning for the school site.

Write a Site-Specific Disaster Response Plan

1. Meet with the School District Emergency Coordinator to review the district disaster plan. Use this plan as a guideline.
2. The school site plan must be more specific regarding who will handle which responsibilities, and decisions must be made on policies, training and drills.

Establish Evacuation, Assembly Area, Dismissal and Site Evacuation Policies

1. **"Duck, Cover and Hold"** - We must teach students and staff to duck under their desks, cover their heads, and hold onto the desk legs to protect themselves during an earthquake. NEVER run outside during the shaking!
2. **Evacuation** - Determine what type of incident it will take to cause an evacuation. Who decides if there should be an evacuation? Do NOT depend on bells ringing, because electricity may be out, making alarm systems inoperable. Students and staff should exit buildings in an orderly manner immediately after the shaking has stopped.
3. **Evacuation Maps** - Post in every classroom and school work area so even substitute teachers can easily evacuate students.
4. **Assembly Policies** - Students should assemble in an open area away from buildings and power lines. After-shocks will occur! Assembly areas should be predetermined for each class. As soon as students are evacuated, roll call must be taken. Evacuate all able students first, then return for the injured.
5. **Dismissal** - Schools should keep emergency information cards in an easily accessible place. There should be several persons responsible for retrieving these cards in case the primary person is not able or is unavailable. All dismissals must be done in an organized manner to eliminate confusion. Students should only be released to adults whose names appear on emergency information cards.

   Schools should request parents to name five alternative persons on emergency information cards that will be authorized to pick up students in an emergency situation. The sooner the students are released, the sooner staff can go home to their families.
6. **Site-Evacuation** - Schools should have a site-evacuation plan should it become necessary to evacuate students from the site (e.g., due to a hazardous materials cloud approaching the school). As soon as alternate sites have been determined, notify parents which sites have been chosen.

Staff Involvement/Designate Emergency Response Teams

At a school site, EVERY staff member must be assigned a role and responsibility. Because of the large number of students, limited resources on hand and the fact that outside assistance may not be available for quite some time, school staffs must become completely SELF-SUFFICIENT! Make team assignments using the "Emergency Response Teams" chart to assist you.

1. **All Teachers**: (following the evacuation at the assembly area)
   "Buddy System:" One teacher should supervise two classes leaving 50% of all teachers free to report to their team assignment.

   - o Evacuate to the assembly areas.
   - o Take roll-call.
   - o Immediately report all injured/trapped persons with last known whereabouts to the Command Post on the "MISSING PERSONS" form.
   - o Leaving the roll sheet with the person supervising your classroom, report to your team assignment.

2. **Supervision Team**: Consists of 50% of all teachers and all non-injured students.
   NECESSITIES: roll sheets for each class, pen, mini-first aid kit, and "LOG OF ACTIONS TAKEN" form.

   - o Stay calm and keep children calm.
   - o Account for all students.

- o Update roll sheets as students are released.
- o When numerous students have been released, teachers must become available for reassignment to teams that need additional assistance.

3. **Command Post**: Consists of Principal, Communications Coordinator and Volunteer Coordinator. Older children may be utilized as "message runners."
   NECESSITIES: radio, bullhorn, list of staff assignments, a log, disaster plan, "LOG OF ACTION TAKEN" forms, "SCHOOL STATUS" form, maps of the facility, a battery powered radio and 2-way communication to the school district office.

   - o Coordinate all personnel and operations.
   - o Reassign staff as necessary (if a fire is burning, staff will have to be reassigned to fight the fire immediately.)
   - o This is the information collection point.
   - o Communication with district office.
   - o Document all actions taken.
   - o Periodically assess the situation and make necessary changes.
   - o Report any changes in your situation following aftershocks.
   - o Coordinate with all arriving agencies, e.g., fire, police.

4. **Search and Rescue Team**: Consists of 20% of teachers who should be physically able to do lifting.
   NECESSITIES: Hard hats, leather gloves, flashlights, sturdy shoes, stretcher, first aid kit, chalk, rescue tools and "LOG OF ACTIONS TAKEN" forms.

   - o Pick up supplies and put on protective clothing.
   - o Pick up "MISSING PERSONS" forms from the principal.
   - o Rescue victims and perform emergency first aid.
   - o Load onto stretchers and transport injured to medical aid area (or have older students available to move victims)
   - o Search LAST KNOWN locations of missing students first.
   - o Perform an organized search of all facilities.
   - o Put an "X" on the door of rooms that have been completely searched.
   - o When duties are complete, report to the Command Post for reassignment.

5. **Damage Assessment Team**: Consists of maintenance employees and 5% of teachers.
   NECESSITIES: complete set of campus keys, tools to shut off utilities, knowledge of fire protection equipment, "LOG OF ACTIONS TAKEN" forms.

   - o Move all emergency supplies to assembly areas.
   - o Put out fires if possible; request assistance if needed.
   - o Determine if the gas must be shut off; shut off if necessary.
   - o Check other utilities: water, electricity, sewage, telephone.
   - o Document all damage to facilities.
   - o Report damage and utility information to the Command Post.
   - o When duties are complete, report to the Command Post for reassignment.

6. **Student Release Team**: Consists of office staff plus 5% of teachers; more teachers and volunteer parents can assist this team as they become available.
   NECESSITIES: Emergency card file, pens, folding table and chairs, "Student Pick Up Area" sign in all languages common to your school and "LOG OF ACTIONS TAKEN" forms.

- o Set up release station.
- o Send runner (teacher or older student) to pick up student.
- o Document all releases.
- o Release students as quickly as possible.
- o Within 15 minutes you will be bombarded with panicked parents; ask for parent volunteers! They can be used as runners.

7. **Medical Aid Team:** Consists of school nurse and 20% of teachers; all should have CPR and first aid training. NECESSITIES: large first aid kit that could serve 20% of the school population, tarp, first aid log.

   - o Set up first aid station.
   - o Lay out supplies for easy access.
   - o Triage victims! Sort out, by injury, those you can help with your level of training and supplies.
   - o Report to the Command Post of victims you are unable to handle, so that requests for professional medical help can be made.
   - o Log all injuries on first aid log or triage tags.

8. **Message Runners/Stretcher Carriers:** Train older, responsible students.

Stockpile Emergency Supplies

Parent Education and Involvement

1. Now that the Disaster Preparedness Committee is in place, the plan is written, policies have been established, team assignments have been made, and a list of Emergency Supplies are on hand, it is time to start working with parents.
2. **PTO Planning Committee Representative** - The Parent, Teacher Organization (PTO/PTA/PSTA) should have a representative on the Disaster Preparedness Planning Committee. This representative will make periodic reports as to the committee's progress at the PTO meetings.
3. **Emergency Tools and First Aid Equipment** - Parents can do fund-raisers or donate needed emergency supplies. They may also volunteer their time to purchase, organize and stockpile the necessary supplies. Just give them a place to store the supplies and many parents will be glad to assist with this important project.
4. **Food and Water** - Schools should consider having canned food drives at the beginning of each school year. The items can be stored on the school premises for availability when needed. If not used during the school year, they can be donated to a worthy charity for the homeless.

Train Team Members

1. **CPR and First Aid Training** - All staff members on the Medical Aid Team, Search and Rescue Team and Supervision Team should take CPR and First Aid Training. These classes are offered by the American Red Cross.
2. **Fire Extinguisher Training** - Some local fire departments offer fire extinguisher training.
3. **START (Simple Triage and Rapid Treatment)** - Information about triage of patients is available through some hospital paramedic offices. The START video is available for purchase, along with a training manual from Hoag Hospital, (714) 760-5687.
4. **Utilities** - If you have questions about utilities, contact your local gas and electric companies or your water department.

Educate Students

Students must understand that natural hazards are exactly that, natural. There are events in this world that we have no control over.

1. Train students to "duck, cover, and hold." Stress the fact that rescuers will be looking under desks when searching for victims following an earthquake.
2. Train students in proper evacuation procedures.
3. Students should be made aware of the location of their assembly area. They may be at lunch or recess and have to assemble.

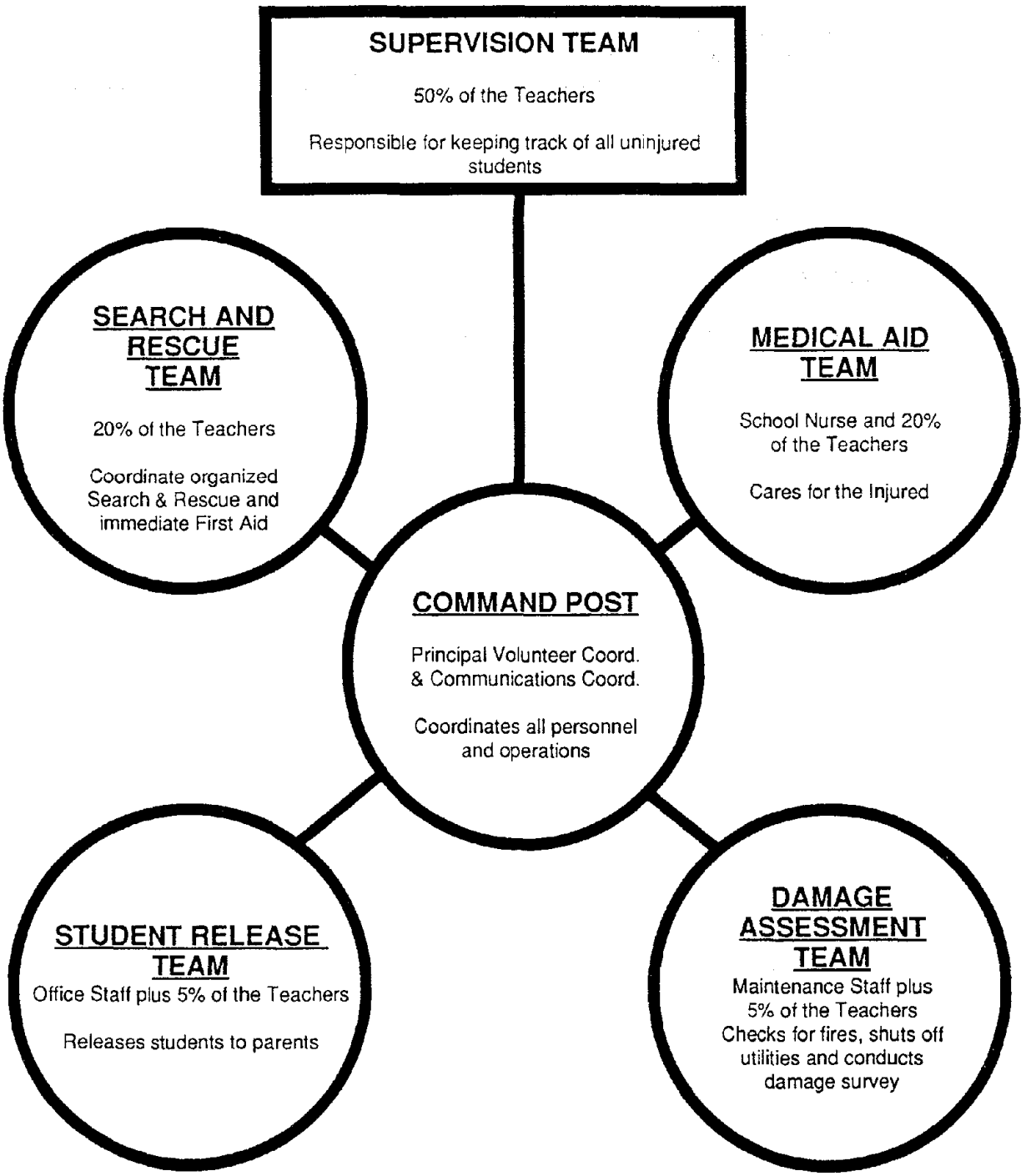
Students learn easier by doing, so practice all of the above.

Do a School Hazard Hunt

Practice Disaster Drills

Schools should have earthquake drills four times per school year.

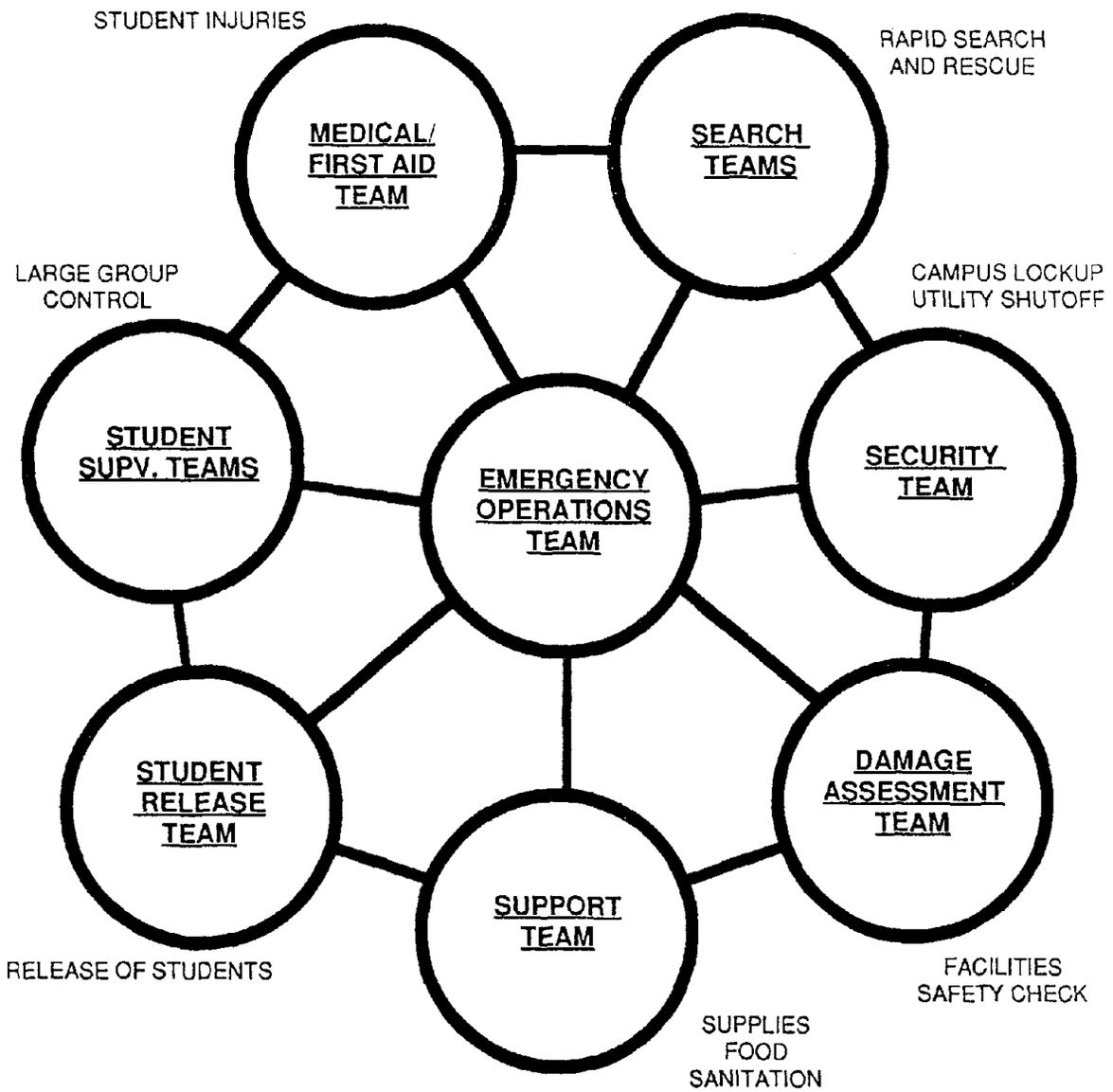
EMERGENCY RESPONSE TEAMS
Elementary Schools



SCHOOL EMERGENCY ADMINISTRATION

A guide developed by the Orange County Red Cross

HIGH SCHOOLS



EARTHQUAKE SUPPLY LIST FOR SCHOOLS

I. PLANS

- SCHOOL DISTRICT DISASTER PLAN
- SCHOOL DISASTER PLAN
- MAP OF FACILITY WITH UTILITIES, UTILITY SHUT OFF TOOLS AND ASSEMBLY POINT LOCATIONS CLEARLY MARKED
- LOCATION OF MASTER KEYS
- LIST OF STAFF ASSIGNMENTS, TEAMS AND DUTIES
- LOG OF ACTION
- BUDDY SYSTEM PLAN

II. COMMUNICATIONS

- RADIO COMMUNICATIONS TO THE SCHOOL DISTRICT OFFICE
- BATTERY POWERED AM/FM RADIO
- EXTRA BATTERIES

III. FIRST AID SUPPLIES

- MINI CLASSROOM FIRST AID KITS FOR EACH CLASSROOM
- A FIRST AID KIT OR TRAUMA KIT THAT WOULD SERVE NUMEROUS PERSONS
- STRETCHERS

IV. FOOD AND WATER

- ONE QUART OF WATER PER PERSON PER DAY
- NUTRITIONAL FOOD BARS
- CANNED FOODS, STEWS, JUICES

V. SANITATION SUPPLIES

- LARGE TRASH BAGS/TIP WRAPS
- POWDERED LYE
- TOILET PAPER

VI. RESCUE TOOLS

- HEAVY GLOVES	FIRE AXE	BLADES
- ROPE	HARD HATS	PLIER SET
- SHOVELS	EYE GUARDS	HAMMER
- PICKS	DUST MASKS	SCREWDRIVERS
- WRENCH	HACKSAW	JACK

VII. OTHER SUPPLIES

- MEGAPHONE	LANTERN
- LIGHT STICKS	TARPS
- BLANKETS	DUCT TAPE
- FLASHLIGHTS	
- EXTRA BATTERIES/BULBS	

EARTHQUAKE SAFETY

SCHOOL/CLASSROOM CHECKLIST

These nonstructural hazards are only some of the typical hazards to look for. This list is not meant to be all inclusive.

Nonstructural hazards to look for are:

[ ] 1. Location and access to turn off gas, electric and water. Water heater should be strapped down.

[ ] 2. Check the location of the First Aid supplies, should be easily accessible.

[ ] 3. Science Room - Are liquids in unbreakable containers rather than glass containers. Separate glass objects so they will not be jolted against each other and break, store chemicals on low shelves. Keep all cabinets locked at all times. It is recommended installing an earthquake shut off valve on natural gas lines and/or a valve to all gas lines in home economics, cafeterias, and science labs.

[ ] 4. Where are heavy objects stored or placed; i.e., potted plants sitting on top of file cabinets. Look to see what is stored in high cupboards that could fly out. Move to low shelves or make sure cupboards have secure latches.

[ ] 5. Tall shelving and bookcases in the library. Perhaps a wood brace over the top and/or attached to the wall to hold the shelving together/upright.

[ ] 6. Any hanging objects, such as hanging plants, the hooks should be closed.

[ ] 7. File cabinet or open shelving should be bolted to wall studs.

[ ] 8. Typewriters and computers secured.

[ ] 9. Partitions in a long row will fall over if not bolted to the floor. If this could be a danger, suggest they square them for more support.

[ ] 10. Emergency Power Generators. The base should be bolted to the floor.

[ ] 11. Is access to doors or other exits blocked, or partially blocked at anytime by anything.

[ ] 12. Venetian blinds or translucent shades on windows should be secured.

[ ] 13. The overhead lights should be attached to ceiling securely.

[ ] 14. Ceilings should be light weight acoustical tiles.

[ ] 15. Maintenance storage areas should be checked for hazardous chemicals. These need to be properly stored where they will not fall or spill and mix together.

Basically, any object that you can see that could topple onto a child or block a door.

SEARCH AND RESCUE CHECKLIST

IN EARTHQUAKES AROUND THE WORLD, 80-85% OF ALL LIVE VICTIMS HAVE BEEN RESCUED BY FAMILY, FRIENDS OR COWORKERS!

PREPARATION:

_____ Establish a Search and Rescue Team.

_____ When designating the Search & Rescue Team look for individuals that are physically fit and able to provide emergency care to victims.

_____ Establish a leader and chain of command.

_____ Get facility maps and radio communication.

RESCUE TOOLS: Establish a cache and locate it in a safe area. A cargo container stored away from the main building is ideal.

____ heavy leather gloves
____ hard hat
____ hard shoes or boots
____ dust mask
____ eye protection
____ identification vest
____ clipboard
____ flashlights & extra batteries

____ first aid kit
____ first aid book
____ stretcher/litter

____ shovel(s)
____ crow bar(s)
____ sledge hammer
____ hacksaw and blades
____ wood saw
____ pliers set
____ claw hammer
____ assorted nails
____ adjustable crescent wrench set
____ screwdrivers
____ utility knife
____ pipe wrench
____ duct tape
____ rope
____ pry bar, 5-6'
____ fire axe
____ ladder
____ hydraulic jacks, 20-50 ton

SITUATION ASSESSMENT:

_____ Make sure you are operating safely. It is important for the rescuer not to become a victim. "If you are not part of the solution you are part of the problem."

_____ Keep your purpose in mind at all times: To bring out buried victims alive.

_____ Leader must assess the situation; Accurate information can save lives.

_____ Locate Hazards: Fires, downed wires, nature and extent of damage, presence of flammable chemicals, broken water pipes, broken sewage pipes (for health reasons) and the likelihood of further collapse.

_____ Determine the type of collapse, survey the building.

_____ Determine the location where live victims would most likely found. First, go to areas where the majority of the victims should be located.

_____ As volunteers show up, someone should be designated to coordinate their efforts. Volunteers such as neighbors may have needed equipment and valuable knowledge.

SAFETY MEASURES:

_____ Protective clothing should be worn at all times: hard hat, boots, gloves, flashlight, dust mask, eye protection, identification vest, etc.

_____ No one works alone; Use a buddy system; Maintain constant watch over your "buddy".

_____ No smoking, candles or fires near the collapse.

_____ Do not move faster than is safe.

_____ Protect victims from further danger.

_____ Turn off electricity, gas and water to the collapsed building if necessary.

_____ Leader must coordinate and control all operations and activities.

_____ Maintain discipline of rescue workers and activities.

_____ Clear the area of non-rescue involved persons.

_____ Think before making a move!

_____ Be aware that climbing on the collapsed building may further injure someone trapped underneath.

_____ Following each aftershocks, survey the collapse again.

THE SEARCH AND RESCUE MISSION:

_____ Attempt to locate victims by last known locations.

_____ All efforts should go toward rescuing surface victims and get them to the first aid area.

_____ Systematically break your search area down into small areas such as buildings and then individual rooms.

_____ Check each room thoroughly; closets, corners, etc.

_____ Once a room or area is checked thoroughly, it should be marked with an "X" on the door or area using chalk or marker.

_____ When necessary, call out to potential victims, keeping the area quiet and listen for a response. Also try using a whistle or tapping and these sounds may help you to zero in on survivors.

_____ When a survivor is located, attempt to keep his moral up by talking to him. Communicating with the injured will help them to cope with the situation.

_____ Administer life saving first aid before removing and transporting to medical aid area.

_____ Ask rescued victims about the possibility of any other victims in the area.

_____ Direct workers to remove living casualties only until all are rescued, then return for the deceased.

_____ Remove debris CAREFULLY; Too many people on top of a pile of rubble can cause more damage than good.

_____ Keep all rescue equipment in a safe area.

_____ When professionals arrive on the scene, turn over command to them. Stand by to brief them and provide assistance when necessary.

CASUALTY HANDLING AND REMOVAL:

_____ Insure secure footing.

_____ Hand stretcher from person to person if the path is hazardous.

_____ Use planks or ladder over wide gaps.

_____ Provide adequate light for rescuers.

THESE ARE NOT RULES, THESE ARE GENERAL GUIDELINES. TEACHERS ARE GOING TO HAVE TO TAKE CHARGE OF THE SITUATION AND IMPROVISE. DIFFICULT DECISIONS WILL HAVE TO BE MADE.

A special thanks to the following individuals for preparing this Search and Rescue checklist for schools:

Mike McGroarty, Battalion Chief
La Habra Fire Department

Judith Drake, Neighborhood Watch
City of Fountain Valley

J.B. Hume, Search & Rescue Coordinator
Huntington Beach Police Department

Vic Subia, Captain
Huntington Beach Fire Department

Rich Dewberry, Fire Chief
and the Laguna Beach Fire Department

Glorria Morrison, Emergency Services Coordinator
City of Huntington Beach

LOG OF ACTIONS TAKEN

Date of this page: _____ Page number _____ of ____

TIME	REPORTING PERSON	STUDENT NAME	INFORMATION/MESSAGE/ ACTION TAKEN

. . . TAKE THE TIME TO RECORD INFORMATION . . .

MISSING PERSONS

NAME: _____

LAST KNOWN LOCATION OR ACTIVITY_____

_____

GENERAL DESCRIPTION & CLOTHING_____

_____

- -

NAME: _____

LAST KNOWN LOCATION OR ACTIVITY_____

_____

GENERAL DESCRIPTION & CLOTHING_____

_____

- -

NAME: _____

LAST KNOWN LOCATION OR ACTIVITY_____

_____

GENERAL DESCRIPTION & CLOTHING_____

_____

SCHOOL STATUS FORM

DATE: _____ TIME: _____

1. FATALITIES: #_____

2. INJURIES: Major (Can't care for): #_____

   Moderate (Can care for): #_____

3. MISSING PERSONS: #_____

4. MEDICAL AID REQUIRED: a. _____ (Manpower) b. _____ (Supplies)

5. HEAVY RESCUE REQUIRED: a. _____ (Manpower) b. _____ (Equipment)

6. OTHER ASSISTANCE NEEDED: _____

   _____

   _____

7. FACILITIES:
   A. Buildings collapsed (yes or no)
   B. Water operational (yes or no)
   C. Gas operational (yes or no)
   D. Gas shut off (yes or no)
   E. Sewage operational (yes or no)
   F. Telephone operational (yes or no)

SCHOOL DISTRICT STATUS FORM

SCHOOL _____

DATE: _____ TIME: _____

1. FATALITIES: #_____
2. INJURIES: Major (Can't care for): #_____
   Moderate (Can care for): #_____
3. MISSING PERSONS: #_____
4. MEDICAL AID REQUIRED: a. _____ (Manpower) b. _____ (Supplies)
5. HEAVY RESCUE REQUIRED: a. _____ (Manpower) b. _____ (Equipment)
6. OTHER ASSISTANCE NEEDED: _____

_____

- -

UPDATE

DATE: _____ TIME: _____

1. FATALITIES: _____
2. INJURIES: Major (Can't care for): _____
   Moderate (Can care for): _____
3. MISSING PERSONS: _____
4. MEDICAL AID REQUIRED: a. _____ (Manpower) b. _____ (Supplies)
5. HEAVY RESCUE REQUIRED: a. _____ (Manpower) b. _____ (Equipment)
6. OTHER ASSISTANCE NEEDED: _____

_____

7. FACILITIES:
   A. Buildings collapsed (yes or no)
   B. Water operational (yes or no)
   C. Gas operational (yes or no)
   D. Gas shut off (yes or no)
   E. Sewage operational (yes or no)
   F. Telephone operational (yes or no)

Part IV

Team Players: Defining Your Roles

4-1 Principals
- 4-1-1 The Principal's Role
- 4-2-1 Communication After the Quake
- 4-3-1 Earthquake Drills

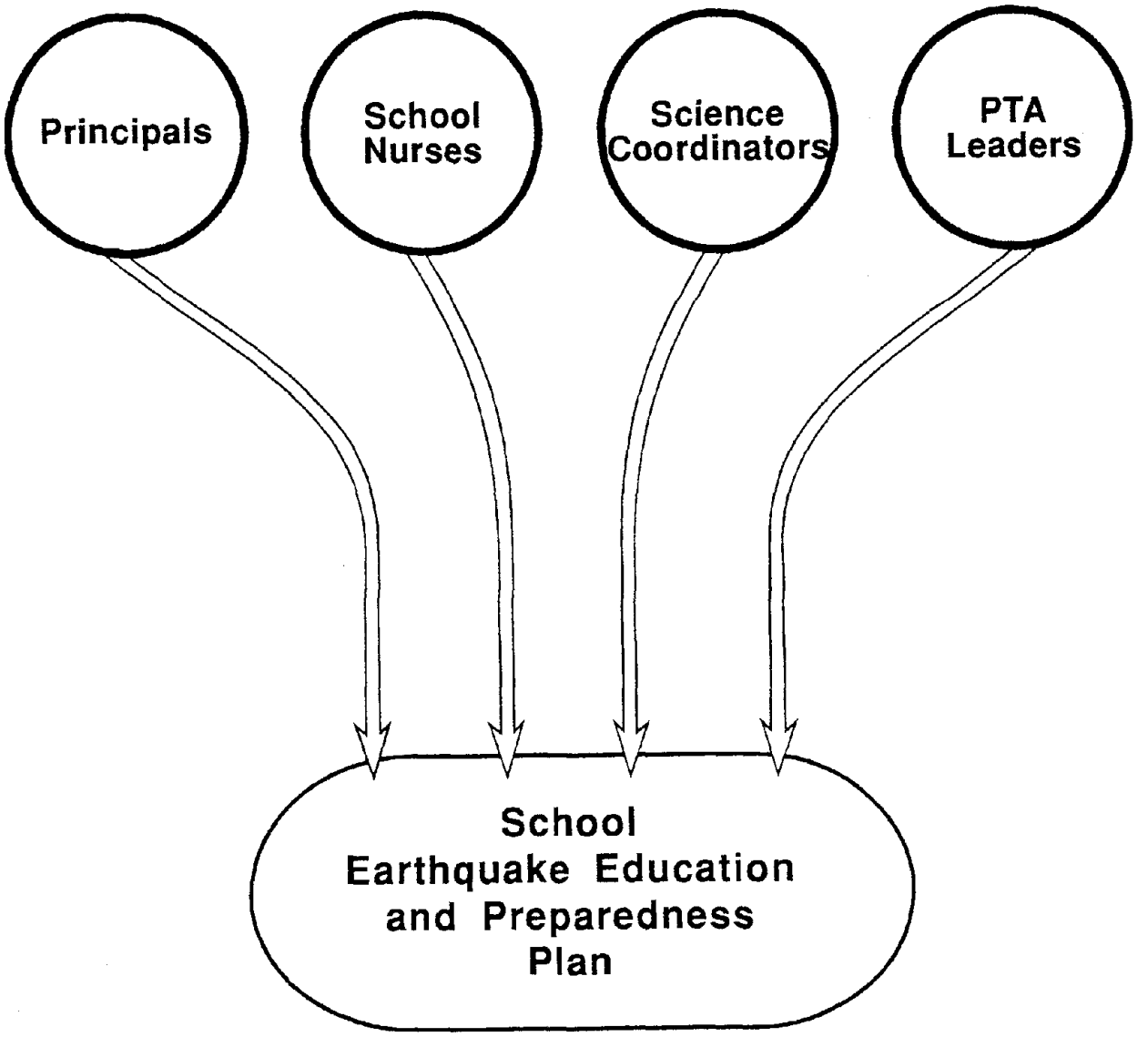
4-2 School Nurses
- 4-2-1 Team Training and Supplies for Medical Response
- 4-2-2 Earthquake Preparedness for Children with Chronic Medical Conditions
- 4-2-3 Special Education Students on Integrated Sites
- 4-2-4 Shelters for the Severely Handicapped
- 4-2-5 Non-structural Hazard Mitigation in the Classroom

4-3 Science Coordinators
- 4-3-1 Earthquake Education Curricula: A Necessary Part of Earthquake Mitigation in the Schools
- 4-3-2 Earthquake Education Within State Science Frameworks
- 4-3-3 Integrating Earthquake Education in the Health Curriculum
- 4-3-4 Student Teams Utilized in a Disaster Situation

4-4 PTA Leaders
- 4-4-1 What Parents Should Know About Earthquake Preparedness
- 4-4-2 Caring for Children's Psychological Needs

Earthquake preparedness is more than one individual's responsibility; it's a team effort. However, the team members need to be familiar with the pertinent issues involved in earthquake education and preparedness, and have a clear idea of their responsibilities. In this workshop, the following team players were identified:

Planning Requires Team Work



Principals

The Principal has the overall responsibility for the school site plan. As part of this plan, principals need to address the following:

- Communication
- Student Safety and Security
- Student Release Policy
- Parent Relations
- Media Relations
- Earthquake Drills

The Principal's Role

By Marilyn Boyd
Principal
Stone Creek Elementary School
Irvine Unified School District

At this session, principals will have the opportunity to see a video of an earthquake drill in progress. They will view the debriefing that followed the drill. A panel of administrators has been assembled to briefly discuss the various components of earthquake preparedness. The panelists are: Diane Dougherty, principal, Meadow Park School, Irvine; Dan Thomas, principal, Westwood Basics Plus School, Irvine; and Bob Bruce, Director of Secondary Education, Irvine. Time will be set aside for questions and answers.

Student Release Coordination and Security Summary

Before Drill:

- Select an evaluation area that is free of wires, trees etc. and easily supervised by a few adults.
- Have parents complete a special, brightly colored emergency card with student picture on it.
- Have teachers place cards in a packet that is secured by the exit of each classroom.
- Make sure office staff has emergency supplies readily available: school emergency cards, pens, dismissal record sheets, attendance folders table and chairs (stored near Emergency Operation Area).
- Ask parents to be involved in the drill and walk through the release procedure.
- Designate that the School Secretary will be in charge of the Emergency Operation Center. Other office staff can provide assistance.

During the Drill:

- Have teachers use cards after evacuation to determine who is present in the evacuation area.
- Have teachers send cards of those present in the evacuation area and those students absent from school to the Emergency Operations Center. All other cards should be sent to the first aid station located in the most enclosed area possible to use (consider an outside eating area so that tables can be used for injured students to rest on). Teachers should send Class Accountability Report to the Emergency Operations Center. Teachers should record on class record sheets attendance at evacuation time and keep the record sheet current when students are dismissed from the evacuation area.
- Send all available personnel, and later, some older students to assist at the Emergency Operations Center as runners.
- Document dismissals, injuries and actions taken. Accountability reports and Building Status Reports will be maintained at the Emergency Operation Center.
- When parents arrive to ask for students, runners should go to the evacuation area and bring the child to the Emergency Operation Center. If students are in the first aid area or being evacuated from the building because of injuries, parents will be taken to the first aid area to be with their child.
- All classroom teachers should keep their class record sheet current to reflect dismissals, absences, injured, walking wounded, etc.
- Solicit parents to assist.

Earthquake Drill Sequence

8:45 1. Disaster begins
Shaking stops

2. Evacuate Building to Grass Area
   a. **Teachers** take Disaster packets off walls including current class list and emergency cards.
   b. **Office Personnel** set up Release Center in driveway between bicycles and trash storage shed taking emergency cards and other supplies. Send 5 runners to First Aid - aides if available, then 6th graders.
   c. **Instructional Assistants and Volunteers** - report to Emergency Operation Center for further assignments.
   d. Gather first aid supplies to lunch table areas.
3. **Teachers** - take roll and send Disaster Accountability Form and emergency cards of missing children to Principal or Emergency Operation Center.
4. **Search Team**
   a. Total team meets at First Aid Station after classes evacuate to grass area and submit accountability report and attendance. Put on protective equipment.
   b. Team members go to assigned areas to evacuate students until all are removed.
5. **First Aid Team**
   a. Go to designated area and set up equipment
   b. Deliver first aid to injured. Send initial assessment of injuries to Emergency Operations Center and update as needed.
6. **Rescue Team** - Report to First Aid Center to assist in transporting injured students out of the building and assist with first aid.
7. **One designated staff person should:**
   a. Maintain master map of building with all current triage information.
   b. Report to First Aid area to log injured, keeping map.
8. **Principal** - Emergency Operations Center
   a. Make sure any portable classrooms also evacuated.
   b. Report to Emergency Operations Area for assessment of injuries and damage.
   c. Assist in triage.

Communication After the Quake

By Robert Bruce
Director of Secondary Education
Irvine Unified School District

Communication After the Big One!

Communication - a system for sending and receiving messages. It is essential after a damaging earthquake.

Vern Isgar, Director of Facilities for the San Marino Unified School District in his October 17, 1989 Loma Prieta Earthquake Report said, "Every school employee I spoke with expressed an absolute necessity for better communications. Portable radios are a must. All phones went down for up to several days."

Emergency Information

Details about the earthquake including magnitude, epicenter, effected areas, location of Red Cross shelters, evacuation areas and routes and public safety information will be broadcast on:

Television - Emergency Broadcast System
Radio - Emergency Broadcast System

Intraschool

Coordination of activities among the Emergency Operations Center, Medical Team, Search and Rescue Team, Student Release Team, Student Supervision Team, etc. may be enhanced by low power CB communication. Runners with written messages may be another option for some schools.

Intradistrict

Each school reports deaths, injuries, evacuations and life threatening situations to the District Emergency Operations Center. Damage assessment, unusual events and requests for assistance are also shared with the district. The district provides the schools with policy directions and priorities. Changing evacuation and supply routes, resources, and delays in assistance are also shared with the schools.

Telephone

Pacific Bell has established four Emergency Operation Centers in California, one of which is located in Tustin. The centers have mitigated possible disruption in services with bracing to withstand earthquake movement, and back up power generators and heavy-duty batteries. The $4 million mobile Restoration Express, which handles 8000 phone lines at a time, is also located at the Tustin center.

During past quakes, phone systems with district system hardware (Centrex Systems) have gone down when power was lost. Districts with generators may find that extensive numbers continue to work for internal communication. It is important to disconnect or hang-up all unused phones. Centrally controlled systems like Pacific Bell have been restored to service more rapidly. Direct alarm line and "FAX" lines may work even when local system hardware does not.

Medical and public safety agencies are scheduled to be among the first to have phone service restored. School phones and pay telephones will also have high priority for restoration of service. Celluar phones will probably continue to work in an emergency.

Radios

900 MHZ commerical radio systems may be the most popular at this time. Shortcomings include lack of message security, too many sites talking at once and cost. Transportation Directors may send busses (equipped with portable radios) to each school on a prearranged schedule to provide communication. Maintenance and Operations radio equipped vehicles may also provide school/district communication.

Ham and CB radio operators may be organized to report to various schools in an emergency. Limited ranges and/or message security are concerns.

When All Else Fails

A large red rectangle, like a sheet, may be spread out on the school grounds so aircraft may see it. That indicates a life threatening situation when there is no other means of requesting assistance.

Principal Emergency Conditions

The students, parents and staff at your school will look to you for leadership in any emergency. You are the qualified, trained and designated leader who must establish order out of chaos! Perhaps the following suggestions will help you.

Adjust - New information may require new actions.
Assign - Multiple, urgent tasks require priorities.
Avoid - Don't deal with trivia; focus on important items.
Command - Cooperative styles are too slow in an emergency.
Control - Use others to filter information, develop your plan, delegate, monitor and adjust.
Delegate - Put people to work and insist on feedback.
Do no harm - Don't let others take foolish chances. Up to 70% of all injuries occur after the quake.
Enforce - One person, one boss.
Establish - Open the school Emergency Operations Center.
Evaluate - Re-assign tasks not getting done.
Hang-up - Disconnect or hang-up all phones not in use.
Huddle - Regularly give your leaders current information.
Inform - Keep the district EOC up to date.
Insist - All personnel must carry out their responsibilities.
Lead - You are the one.
Listen - The TV, radio and district EOC have information.
Meet - Bring key people together for brief sharing sessions.
Reassure - Let others know life will go on after this is over.
Record - Litigation will follow; protect yourself.
Remain - Stay at school until released by the district.
Request - Ask for additional help and supplies if needed.
Report - Phone in life threatening situations and injuries.
Select - Use options that allow flexibility in future actions.
State - Make objectives for each team clear to the leader.
Supervise - You cannot do everything, don't do others' work.
Take Charge - Do something; lead even if you might be wrong.

Emergency Communications: Irvine Alternatives[4]

In an emergency, communications are critical to obtaining appropriate assistance. Telephones using a central office may not work for several hours after an earthquake. As long as more than ten percent of the phones are off the hook, the system will not provide dial tone.

Alternative communication systems can be established using existing equipment, low cost additions, or community-based volunteer groups. The City of Irvine and the Irvine Unified School District have joined together to create an efficient set of communication alternatives.

1. **EOC to EOC phone line**: A dedicated business line permits uninterrupted communication between the District EOC and the Irvine Police Department EOC during an emergency. No central office is involved.
2. **Packet radio**: The City of Irvine has purchased TNC's and lap top computers that will be permanently installed in the three high schools and one city park to provide area-wide disaster information communication by computer from the sites to a computer in the amateur radio room in the Civic Center. There will also be amateur radios purchased this spring. Packet radio uses a TNC instead of a modem and a computer instead of a phone. Information is typed onto the screen of the laptop computer, and transmitted in a burst to the radio room computer. It uses less air time and communicates messages with fewer errors because everything is written. The packet system will be installed with a security box to prevent tampering. It will be powered by batteries maintained with a trickle charge system. Amateur radio operators have been preassigned, and will self-dispatch to the sites following an earthquake of 6.0 or greater.
3. **Cellular phones**: After the Loma Prieta earthquake, cellular phones provided important communication links. Once the initial excitement was over and people realized that they could not reach their homes by phone, the cellular to cellular communications systems worked well. The District and the City are working to develop a system of cellular phones in the junior high schools and middle schools. The telephone company offers a reduced service rate for cellular phones intended for emergency use. The service provides for brief test periods, and the rate rises any time the phones are used for a prolonged period of time. The City will be purchasing a cellular phone for the EOC, allowing direct communication with any junior high that has a cellular phone, as well as with police command vehicles that are equipped with cellular phones.
4. **Adopt-a-school**: Amateur radio operators from the Irvine community have formed a volunteer group that will provide amateur radio operators to elementary schools in the District. These people are preassigned, and will self-dispatch after a 6.0 or greater earthquake. They will provide their own radio equipment and power, and will work with the principal to immediately communicate needed information to the police EOC. They will also ascertain whether the packet radio station is functioning, and advise the principal when longer message traffic can be taken by messenger to the high school for computerized communication. In addition, they will provide assistance to citizens in communicating neighborhood concerns to the police EOC.
5. **School buses and maintenance staff**: School buses are often equipped with radios. During the school day the buses are usually at school sites or in the neighborhoods. Buses should be instructed to go to the nearest school and offer communication support to the principal until called on for transportation work. The bus can serve as a communication resource until the radio volunteers arrive and set up their systems.
   Maintenance personnel may also have radios. While these may be useful in an emergency, the frequencies are often shared with many other agencies. This sharing may not interfere with day-to-day operations, but during an area-wide disaster, communication may be difficult on the crowded frequencies.
6. **Messengers**: A messenger system should still be created at every school. Staff members should be assigned to messenger service as both an immediate communication response system, and as an adjunct to electronic communications systems. Most schools have bicycles available during the school day that could be used to carry messages to points where communications might be better, or to deliver the message directly to the district or the EOC. Cars may be driven in local neighborhoods, and transportation patterns may be only minimally disrupted at the neighborhood level.

[4]Reprinted from the City of Irvine, One Civic Center Plaza, P.O. Box 19575, Irvine, CA 92713.

Earthquake Drills

By Linda Smith
Alderwood Basics Plus Elementary School

Alderwood Basics Plus School

Evacuation drills should be held throughout the school year at different times during the school day and under different hypothetical conditions (i.e. student injuries, alternate routes). The following are two sample schedules:

Timeline for Evacuation Drills/Inservice

Schedule 1

1. October 4 - Wednesday
   11:00 a.m.
   Fire Drill
2. October 27 - Friday
   11:00 a.m.
   Drop-line-grass-injured. All teams in action.
3. November 15 - Wednesday
   9:15 a.m.
   Fire Drill
4. December 13 - Wednesday
   10:00 a.m.
   Fire Drill
5. January 16 - Tuesday
   Recertification of CPR/FirstAid/Triage and fire extinguishers
6. January 30 - Tuesday
   10:50 a.m.
   Drop-line-(grass?)
   Missing students, injuries, fire in building, parent observation, alternate routes
7. February 16 - Friday
   2:15 p.m.
   Fire
8. March 16 - Friday
   1:35 p.m.
   Fire
9. April 3 - Tuesday
   9:30 a.m.
   Fire
10. May 14 - Monday
    1:35 p.m.
    Drop-line-grass-wounded-search-first aid-release gate in action with lead people injured/out. Re-enter the building, transfer first aid station. Activate IDEC volunteer (Ham operator).
11. June 7 - Thursday
    11:30 a.m.
    Fire

Timeline for Evacuation Drills/Inservice

Schedule 2

1. September 27 - Tuesday
   11:00 a.m.
   Drop-evacuate to lines then grass.
2. October 19 - Wednesday
   1:30 p.m.
   Use alternate route out of the building. No lights in building.
3. November 16 - Wednesday
   9:15 a.m.
   Drop-line-grass
   One teacher remains in class (buddy takes out both classes).
   Teachers will decide who stays and who evacuates.
   First Aid and Search Teams in action.
4. November 17 - Thursday
   Parent Education Night
   Subject: Disaster Planning.
5. November 28 - Monday
   2:00 p.m.
   All teams activated, parent pick-up, activate extended student supervision.
6. January 17 - Tuesday
   Recertification of CPR/First Aid/Triage and fire extinguishers.
7. January 26 - Thursday
   10:50 a.m.
   Drop-line-grass.
   Missing students, injuries, fire in building, parent observation.
8. February 23 - Thursday
   Unannounced
   Drop-line-grass.
   Missing/wounded students, buddies taking classes to grass, search team and first aid team in action.
9. April 4 - Tuesday
   1:35 p.m. (recess)
   Drop-line-grass-wounded-search-first aid-release gate in action with lead people injured/out. Re-enter the building, transfer first aid station. Activate IDEC volunteer (Ham operator).

School Nurses

The school nurse understands the need for triage, first aid, advanced medical treatment, possible coroner operations at the school site after a disaster, and counseling students and staff. As part of the team, school nurses need to address issues such as the following:

- o Supplies for Medical Response
- o Team Training for Medical Response
- o Caring for the Disabled/Special Needs Children
- o Caring for Children's Psychological Needs
- o Earthquake Drills
- o Reducing Hazards in the School Environment

Team Training and Supplies for Medical Response

By Sally Snyder
School Nurse
Irvine Unified School District

First Aid Team (FAT)

1. Duties

   - o Establish first aid treatment area.
   - o Triage (evaluate, sort, and prioritize all victims with injuries).
   - o Provide emergency first aid.
   - o Document all first aid treatment administered on triage tag and First Aid Record.

2. Assignment

   - o School nurse (if available).
   - o Trained school personnel (could include instructional assistants) including one person for record keeping.

3. Training

   - o Current first aid certification.
   - o Cardiopulmonary Resuscitation (CPR) certification.
   - o Triage knowledge.
   - o Organization of an emergency first aid center.

4. Equipment

   - o First aid kit (school kit supplemented with major trauma supplies)
   - o Stretcher
   - o Blankets
   - o Flashlights
   - o Triage tags
   - o Emergency Medical First Aid Record
   - o List of students with special medical problems
   - o Supplies for special needs students (medication, food for diabetics, etc.)
   - o Walkie-talkie

5. Procedures

   - o Take roll call.
   - o Complete Accountability Form.
   - o Report to Emergency Operations Person at assembly area with Accountability Form.
   - o Establish first aid treatment area.
   - o Establish team leadership: walkie-talkie intake, recorder, and director of rescue and first aid.
   - o In conjunction with Emergency Operations Team, determine availability of emergency medical services.
   - o Using S.T.A.R.T. system and Triage Tags, sort patients as to immediate, delayed, ambulatory, or deceased.

- Record keeper follows and fills out Emergency Medical First Aid Record.
- Treat immediate category patients and prepare for transport and/or appropriate care.
- When outside emergency responders arrive, they must be fully briefed as to injury status (i.e., triage tag and first aid record).
- Establish a morgue area, if needed.
  a. Major concerns are identification and preservation of the body and documentation as to the cause of death.
  b. Bodies should be covered, undisturbed, and located in an area away from surviving victims.
  c. Care should be taken when selecting a morgue site since, according to state law, any area of equipment that comes in contact with the dead can never be used to prepare food again.

Search Team (First Priority)

1. Duties

   - Search all facilities for injured or trapped personnel to ensure complete evacuation. Perform fire suppression, life saving first aid when needed, and assess building for damage.

2. Assignment

   - Custodian and staff members trained and physically capable to perform light rescue and other duties listed above.

3. Training

   - Standard first aid/CPR/triage
   - Fire extinguisher usage
   - Red Cross damage assessment course

4. Equipment

   - Flashlight/lightsticks
   - Hard hats
   - Leather gloves
   - Sturdy shoes
   - Walkie-talkie
   - Clipboard and pencils
   - Stretchers
   - Fire extinguishers
   - Ax or crowbar
   - Blankets
   - Shovels

5. Procedures

   - Take roll call.
   - Complete Accountability Form.
   - Report to Emergency Operations Person at assembly area with Accountability Form.
   - Report to office area.

- o Begin search with partner. Notify EOT if partner is needed.
- o Inspect all classrooms, bathrooms, office, stage, portables, etc., for missing or injured.
- o Perform fire suppression and lifesaving first aid techniques as needed. Summon first aid team and additional help as needed by walkie-talkie or student runners.
- o Note general damage to structures.
- o Upon completion of search, report to Emergency Operation Center and then begin second priority.

Note: Search Teams should not be delayed by any particular victim or problem but should have other personnel take charge as soon as possible so that they can continue their search of entire grounds.

Search Team (Second Priority)

1. Duties

   - o Document the nature and extent of damage to facilities.
   - o Determine if buildings can be reinhabited.

2. Procedures

   - o Assess damage to reading lab, media center, and stage.
   - o Record all damage to building on Damage Assessment Form.
   - o Report to Emergency Operations Team.

Disaster Preparedness

First Aid Supplies

1. General Considerations

   - o Types of potential injuries
   - o First aid supplies already at the school
   - o What school materials can be adapted and used in care of the injured
   - o Money
   - o Availability of storage space at the school
   - o Need for multiple storage areas at the school
   - o Alternate locations for first aid station
   - o Upset parents and/or other community members
   - o Students with special health needs (physical and emotional)
   - o Staff members with special health needs and/or family concerns and obligations

2. Potential Types of Injuries

   Mild to severe: bruises, lacerations, fractures, sprains, burns, foreign objects in eye, head injuries, varying levels of consciousness, internal injuries, puncture wounds, impaled objects, neck injuries, back injuries, respiratory problems.

3. Trained Personnel - This requires

   - o Individuals who can make sound decisions while under pressure
   - o Individuals who can deal with injury situations
   - o Current first aid skills (preferably certification)
   - o CPR certification (helpful)
   - o Working knowledge of triage
   - o Multiple people trained and assigned to ensure coverage
   - o Practice disaster drills so everyone can practice his/her assigned task simulate caring for injured and emotionally upset individuals
   - o Knowledge of an accurate record-keeping system

4. Prepare for Individuals (Students and Staff) Special Needs

   - o Medication needs for extended period of time (Diabetic, epileptic, cancer, asthmatics, etc.)
   - o Medical treatment needs
   - o Physical impairment - vision, hearing, mobility

5. Plan and Practice

   - o Have a plan for the school
   - o Practice - Refine - Practice - Refine

6. Type of First Aid Supplies Needed

   - o Gauze bandages (variety of sizes)
   - o Triangular bandages
   - o Band aids
   - o Tape
   - o Splints
   - o Antiseptic
   - o Irrigation solution
   - o Scissors
   - o Stretchers
   - o Disposable gloves

7. First Aid Supplies Already in School

   - o Identify amount and location (health office; first aid kits)
   - o Determine additional supplies needed depending on size of school

8. Other School Supplies Which Can Be Adapted for Use as First Aid Supplies

   - o Books and magazines (splints)
   - o Masking tape (for affixing bandages or splints)
   - o Sanitary napkins (bandages)
   - o Paper towels (bandages)
   - o Health office disposable towels/blankets (blankets)
   - o Jackets, sweaters (as blankets)
   - o Janitorial supplies (plastic bags for waste disposal)

Earthquake Preparedness for Children with Chronic Medical Conditions

By Mary Zombek, R.N., P.N.P.
Huntington Beach Special Center

The Orange County Children's Hospital Endocrine/Metabolic Department Provided the Following Recommendations for Earthquake Preparedness for Children with Chronic Medical Conditions

1. All children with a chronic medical condition or on medication need to wear a Medialert necklace or bracelet at all times.

2. A three day supply of medication should be stored at school for conditions in which a lack of medication may endanger the child's life or well being. Written instruction of the medication, dose, and recommended schedule for giving the medication (i.e. 1 tablet 3 times a day) must be included as well as any other information specific to the child's medical condition. Schools should have arrangements for two designated places to store earthquake supplies (book bags, purses, or lockers can be used as well).

A 72 hour supply of the medication listed below is recommended:

Adrenal Hormone Problems	Cortisone	If the child is hurt or ill, double usual dosage and give Cortisone 3 times daily
	Florinef	Usual dose
Hyperthyroidism	PTU or Tapazole	Usual dose
Calcium Problems	Rocaltrol	Usual dose
	Calcium	Usual dose
Seizure Disorder	Antiepileptics	Usual dose
ADD	Ritalin, Dexadrine, etc.	Usual dose

Other chronic illnesses:

Renal Failure
Hemophilia
Juvenile Rheumatoid Arthritis
Asthma
Congenital Heart Disease
Phenylketonuria

EMERGENCY STUDENT MEDICATION/SPECIAL NEEDS

The Disaster Planning Committee of Orange County Department of Education, Special Schools recognizes that your child may have special needs. In the event of a disaster it is imperative that these needs be met. Therefore it is suggested that a 3 day supply of medication/supplies be sent to school to be utilized in the event of a disaster.

Special needs: medication diapers
tube feeding formula change of clothes

MEDICATION(S)	REASON MEDICATION IS GIVEN	DOSE	TIME(S) GIVEN

We, the undersigned parents of _____ request that medication(s) be administered to our child if needed during and after an emergency by school staff. It is understood that the school is not legally obligated to administer medication to my child, therefore, I agree to indemnify and hold the Orange County Department of Education and its employees or agents harmless from any and all claims, demands, suits, challenges, or other action arising from the administration of medication or the provisions of special services as outlined above.

I WILL NOTIFY THE SCHOOL IMMEDIATELY OF ANY CHANGES TO THE KIND, DOSE, OR TIME ADMINISTERED OF ANY STUDENT MEDICATION.

_____

NAME OF PHYSICIAN PHYSICIAN'S TELEPHONE NUMBER

PARENT(S) NAME ADDRESS PHONE

DATE BUSINESS PHONE

MEDICATIONS WILL BE SENT HOME TO BE ROTATED BEFORE EXPIRATION DATE.

PARENT/GUARDIAN SIGNATURE

072589154

Disaster Preparedness for Students Who Are Medically Fragile

1. **Definition**: Medically Fragile is a condition which may be life threatening and requires interpretation, intervention and monitoring.

2. **Preparedness Activities:**

   - o Determine equipment/supplies necessary for the provision of first aid and SPHCS.
   - o Identify pupils who are on medications and secure a supply of the medication sufficient for a three day period (this should include pupils who normally only receive medication at home.)
   - o Identify pupils who receive any kind of medical service which is dependent upon external power. Determine and procure alternate power sources.
   - o Plan for transfer of medical records, supplies and equipment from the pre-emergency location to First Aid Area.
   - o Check local area for medical personnel who may be available for an emergency.
   - o Assure that multiple staff members are competent to perform SPHCS procedures in case a designated provider is unable to provide the service in an emergency.
   - o Designate procedures to be followed to ensure that potentially contagious diseases are not transmitted during the emergency.
   - o When planning field trips, have SPHCS equipment in first aid bag.

3. **Equipment**: Have three day supply on hand. The equipment will vary according to medical service (SPHCS) and needs of pupils.

Disaster Preparedness from the American Diabetes Association[5]

General Information

A potential disaster such as an earthquake seldom gives enough warning so that we may prepare ourselves adequately. Having to face such a disaster requires careful preparation and planning ahead, especially when a child with a chronic condition is involved. Planning should include procedures to be carried out at home, school, work, and even in the car.

Emergency items should be kept in a weatherproof, sturdy container which can be easily moved, such as a plastic trash barrel on wheels. There should be enough items to last for 72 hours. Ideally, there should be duplicates of the items in two locations:

- o one set inside
  protected near an inside supporting wall or underneath a strong table, away from glass, brick walls or chimneys, and light fixtures
- o one set outside
  in an isolated storage shed, or cellar

Parents should check with their child's school to ensure that an adequate disaster preparedness program is in place. Conditions after a disaster may necessitate that the child remain on school grounds for a period of time - again, 72 hours worth of supplies is recommended.

Special precautions need to be taken for those children with chronic conditions. School emergency cards should be "tagged" for those who may require necessary medication or treatment in the time of a disaster (a red clip or a red piece of tape protruding from the card may suffice). It might be wise to list an out-of-state contact on the emergency card as well. Necessary medication or treatment supplies with complete instructions should be provided by the parent if the school does not have such items. The school should have designated areas to store these supplies, along with other disaster preparedness items. If the supplies provided by the parent are perishable, then they should be replaced every 6 months or however often the manufacturer suggests (parents can then take the supplies home and use them).

Medical Supplies

Ideally, a plan should be discussed and agreed upon by the parents, physician and the school. A minimum of the following supplies are recommended (in addition to the food supply):

1. Insulin * & 6 insulin syringes (may be used repeatedly if so needed).
2. 6 alcohol wipes (may be omitted if necessary).
3. 12 blood glucose testing strips (must be able to read visually with ease, such as Chemstrip BG)
4. Finger pricking device with lancets (may use lancets repeatedly)
5. Recording log and pen
6. Glucagon Kit *
7. Instant Glucose/cake mate.

Assemble supplies in a ziploc baggie, enclose with the diabetes food supply and label "Diabetes Emergency Supplies." Include a description of diabetes management plan (amount of insulin to be taken, typical symptoms of hypoglycemia, treatment for reactions, meal exchanges, any other medications that need to be taken, etc.). Make changes on the plan as dose adjustments occur.

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[5]Disaster Preparedness Information compiled by Mary Zombek, RN, MS, CPNP, American Diabetes Association, California Affiliate, Inc., Orange County Chapter, 1570 Brookhollow Dr. #120, Santa Ana, CA 92705.

*Insulin and glucagon must be stored in a cool place or at room temperature. It is recommended that insulin be "rotated" approximately every three to six months to ensure full potency (new bottles can be brought in and the "old" bottles can be used at home).

Medical Management (When parents are not with the child)

If the child is old enough for self management, then concern is minimized. However, if the child has been injured or he/she is too young, then a procedure for care must be in place. The following options for diabetes management during a disaster have been suggested by physicians and parents:

1. Use the "Buddy" system; train a responsible friend, sibling, or school personnel (if the school nurse is not full time on site) to administer insulin or glucagon injections and how to treat insulin reactions.
2. If there is no insulin available during a disaster, sugar free fluids should be encouraged as well as a diet consisting of fats and proteins (avoid carbohydrates).
3. If insulin is available but there is a limited food supply, decrease the amount of insulin (stipulate amount agreed upon by parent and physician).

Emergency Supplies for the Car

food
bottled water
flares
fire extinguisher
wool blanket
change of clothes and shoes
flashlight/batteries
Swiss army knife
short rubber hose
packaged towelettes
white sheet or dishcloth (use this for multiple bandages)
gauze pads (2x2 and 4x4)
adhesive tape
non-rinse handwashing soap (such as alcohol foam)
safety pins
scissors
tweezers
cash/coin
chemical cool pack
first aid manual
**critical medication

**Ideally, critical medication should be carried "on person" at all times; the heat from inside a car, can rapidly deteriorate medications.

Emergency Supplies for the Home or School

**Place in a container on wheels (such as a plastic trash barrel)

Bottom of the Container

sleeping bag or blankets (preferably wool)
tube tent (made from a "tube" of plastic) and rope
one change of clothing and shoes
chemical cold packs enclosed in ziploc baggies
white sheet (to tear up for extra bandages)
heavy gloves
toilet paper
packaged towelettes
paper and pen
waterproof matches
candle
signal flare
sterno canned heat
radio and extra batteries
fire extinguisher
paper towels
deck of cards
can opener
2 cooking pots
paper plates
plastic silverware
ax
shovel
cash
water purification tablets
bucket with plastic liners
large plastic trash bags
small container of dish soap

Middle of the Container

food (Please refer to Food Supply list)
instant glucose

Top of the Container

flashlight and batteries
non-rinse handwashing soap (such as alcohol foam)
aspirin and acetaminophen tablets
syrup of Ipecac
prescribed medication (insulin and glucagon, etc.)
first aid handbook
Swiss army pocketknife
Hydrogen peroxide
antibiotic ointment
adhesive tape, 2" wide roll
sterile bandage pads or rolls
triangular bandages
gauze pads (2x2 and 4x4)
sunscreen
disposable gloves
scissors
tweezers
thermometer
diapers
kotex pads
ace bandages
deck of cards

Food Supply

To ensure that adequate food is supplied at school, home, or in the car, multiply the daily total of food group exchanges by 3. For example eight bread exchanges required in one day would be multiplied by three days to equal a total of 24 exchanges needed for the food supply. The following foods have at least a 6 month shelf life:

Milk Group

Cans of evaporated milk
(not sweetened, condensed)
Powdered non/low fat milk
Alba packages
Shelf milk

Meat Group

Peanut butter (unopened)
Canned chicken or tuna
Baby food meat sticks
Canned Vienna sausages
Canned nuts
Beef Jerky

Vegetable Group

Canned vegetables
V-8 juice

Starch/Bread Group

Ready to eat cereals
(in metal containers)
Uncooked cereal
Rice cakes, crackers
pretzels, animal crackers,
and granola bars, all in
tight containers

Fruit Group

Canned fruits and juices*
Dried fruits
(in a metal container)

Combos

Cheese and cracker packages
Peanut butter and cracker packages
Canned pork and beans
Carnation instant breakfast
(1 pkg = 1/2 fruit and 1 meat)

Example:

The following list comprises approximately 15 fruits, 25 breads, 20 meats, and 7 fats:

6 cans apple juice	6 oz. jar of peanut butter
4 ziptop cans of fruit	1 ziptop can of vienna sausage
1 pkg. of dried apples	1 ziptop can of pork and beans
2 packs of beef jerky	1 ziptop can of sesame sticks
2 ziptop cans of tuna	1 small container dry oatmeal

*Extra juice should be stored to treat insulin reactions.
**Dietary information supplied by Sue Billion, R.D.

Special Education Students on Integrated Sites

By Sue A. Wheeler-Ayres
Assistant Principal
Los Angeles County Office of Education

Objective: To provide an outline that will enable you to lessen/avoid problems with special education students during an emergency situation on integrated sites.

Population

1. Classrooms

   - o Know where on campus the special education classes are located
   - o Know the disability of the students (i.e. mentally handicapped, deaf)

2. Personnel

   - o Teachers of special education classes should inservice all staff on the characteristics of their students.
   - o Special education classes should be incorporated into site emergency plans, even if these classes are run by an outside agency and the remainder of the school is run by your district.
   - o If classes are run by an outside agency, they should provide enough supplies (i.e. food, water, medical), to meet your standards.
   - o In making staff assignments for emergency response teams, it would be wise to try and keep special education teachers with their respective students.

Medications/Supplies/Procedures

1. Medication Storage and Documentation

   - o Original copy of doctor's orders kept by school nurse in Emergency Binder.
   - o Copy of doctor's order to be kept with medication.
   - o Medications to be stored in a locked container inside Classroom Emergency Barrel of student receiving medication (key to medication box should be attached to box, nurse and administrator to have duplicates).
   - o Inventory of medications taken at least semi-annually.
   - o 24-hour Medication Sign Off form should be kept by classroom personnel.

2. Medical Supplies/Procedures

   - o Special education classes should know their medical needs and have them as part of their emergency supplies.
   - o Classes may need to include the following:
     a. Hand/foot operated suction machine for tracheotomy students (sterile solutions)
     b. Gastrostomy feeding equipment and food
     c. Colostomy bags (sterile solutions)
     d. Insulin and needles
     e. Diapers/Attends (# of students x 3 diapers/attends per day x # of days reserve)

Transportation to Shelter

1. Location of Shelter

    - o Does it need to be wheelchair accessible?
    - o Distance from shelter to classroom
    - o Will you need to divide it into sections?

2. Methods of Transportation

    - o Pull wheelchairs backward across grass
    - o One to One Carry, Two to One Carry, Three or Four to One Carry
    - o Tarp, blanket, to lay students on and drag them to shelter

***Care must be taken in transporting students to shelter. Take into consideration 1) safety, health and medical problems of the student 2) weight and size of student 3) staff doing the transporting.

Shelter Assembly

1. Area for non-ambulatory, fragile students
    - o Does it need to be next to a fence to provide support for feeding bottles? (avoid fences near power lines)
    - o Does it need to be sectioned off to provide protection for these students?

2. Area for Behavior Disorder Students

    - o Do they need to be on the outside edge of the main group?
    - o Is there a Behavior Management Plan for these students?
    - o Will the students need their restraining gear? (i.e. helmet)

3. Main Population of Handicapped

    - o Do you want these students to wear a "tag" that will immediately identify them as a person with special needs? (i.e. mentally handicapped, deaf)
    - o Run drills and observe how the special education students react in simulated disasters (this may help avoid problems you may not have thought of but exist).
    - o Make sure the special education students are included in your site plans and participate in drills (so that they know your system and become a part of it).

Shelters for the Severely Handicapped

By Sue A. Wheeler-Ayres
Assistant Principal
Los Angeles County Office of Education

Objective: To provide an outline that will enable you to forsee the extra problems encountered in setting up a shelter for a severely handicapped population. This outline is based on a segregated site of 23 classes, of which 10 classes are non-ambulatory. There is a total student population of 230, with an age range of 3 to 22 years. There are a variety of personnel at this site including teachers, assistants, and food service staff.

Population

1. Classrooms

   - o Ratio of adults to students
   - o Ambulation capabilities

2. Personnel

   - o Classroom Teachers
   - o Classroom Assistants
   - o Health Care Assistants
   - o Behavior Assistants
   - o Designated Instructional Service Staff
   - o Maintenance Staff
   - o Food Services Staff

Medication/Medical Supplies

1. Medication Storage and Documentation

   - o Original copy of doctor's orders kept by school nurse in Emergency Binder.
   - o Copy of doctor's orders to be kept with medications
   - o Medications to be stored in a locked container inside Classroom Emergency Barrel of student receiving medication. Inventory should be taken semi-annually (medications transfer with student).

2. Medication Dispensing/Documentation

   - o 24-Hour Medication Sign-Off form will be completed and updated by nurse.
   - o Form to be kept inside locked box with medications (key to medication box should be attached to box, nurse and administrator should have duplicates).
   - o Classroom personnel will dispense medications to students in extended sheltering situations.
   - o "Sign-Off" - initial each dosage given.
   - o If classroom personnel are absent or physically unable to give medications, nurse will delegate responsibility to medical team member.

3. Special Medical Supplies

   - o Hand/foot operated suction machines for tracheotomy students (sterile solutions)
   - o Gastrostomy feeding equipment and food
   - o Colostomy bags (sterile solutions)
   - o Insulin and needles
   - o Diapers/Attends (# of Students x 3 diapers/attends per day x # of days reserve)

Transportation to Shelter

1. Location of Shelter

   - o Is it wheelchair accessible?
   - o Distance to shelter from classrooms
   - o Must have the ability to be divided into sections

2. Methods of Transportation

   - o One to One Carry, Two to One Carry, Three or Four to One Carry
   - o Tarp, blanket, to lay students on and drag them to shelter.

***Care must be taken in transporting students to the shelter. Take into consideration 1) safety, health, and medical problems of student 2) weight and size of student 3) staff doing the transporting.

Shelter Assembly

1. Area for non-ambulatory delicate students

   - o Next to fence (avoid fences near electrical wires), fence provides protection and can be used to hold gastro feeding bags
   - o Section/fence area off (protection from amulatory students)

2. Area for students who wander

   - o Ability to be fenced off
   - o Ability to be visually patrolled

3. Area for Behavior Disorder Students

   - o Ability to be totally fenced off
   - o Consider use of restraining gear (i.e. helmet)
   - o Implement Behavior Plan as is appropriate

4. Area for Remainder of Population

   - o Containment not a priority item
   - o Maintain this group by utilizing games, songs, etc.

5. Medical

   - o Medical Help - Triage, Immediate Care, Delayed Care
   - o Morgue

Meals

1. Minimum of 3 days worth of food/water per student/staff.

   - o Storage may be in individual classrooms, school wings, or centralized.
   - o Remember special diet considerations
     a. Pureed food - hand grinders
     b. Store food which can be eaten by all (i.e. puddings, applesauce, baby cereal, powdered milk).

2. Food Services on Site

   - o Utilize their expertise in food preparation
   - o Utilize their food storage supplies

Utilization of Staff/Communications

1. Immediately after the quake

   - o Maintenance Staff will secure utilities, gates
   - o Minimal Staff to rope out shelter area
   - o Remainder of staff (Food services, DIS, office, etc.) proceed with pre-arranged evacuation assignment.

2. After Shelter is established, divide into pre-assigned teams

   - o Command Post (Chain-of-Command pre-assigned)
   - o Medical Team (headed by nurse, include health assistants)
   - o Damage Assessment Team
   - o Sweep and Rescue
   - o Security Team
   - o Student Shelter Coordinators to address the special needs of the population including those who are delicate, wander, or have behavior disorders.

3. Communications

   - o If possible, you may choose to enlist the aide of students as runners (CAUTION: staff member should know the chosen student, be familiar with his capabilities, and satisfied that he is not disorientated).
   - o Due to the large number of students who will require staff supervision, communication among staff is essential. The least amount of energy expended in this activity the better. Modes of communication include whistles, blow horns, CB radios, and walkie talkies.
   - o Whatever you choose for communication, have a least 1 device per team.

Check with your Adaptive Physical Education teacher for supplies that may be of use in time of emergencies (i.e. scooter boards for transportation, parachutes for transportation or cover from rain or heat, pennies for disaster team identification, whistles, traffic cones, mats, etc.)

Non-Structural Hazard Mitigation in the Classroom

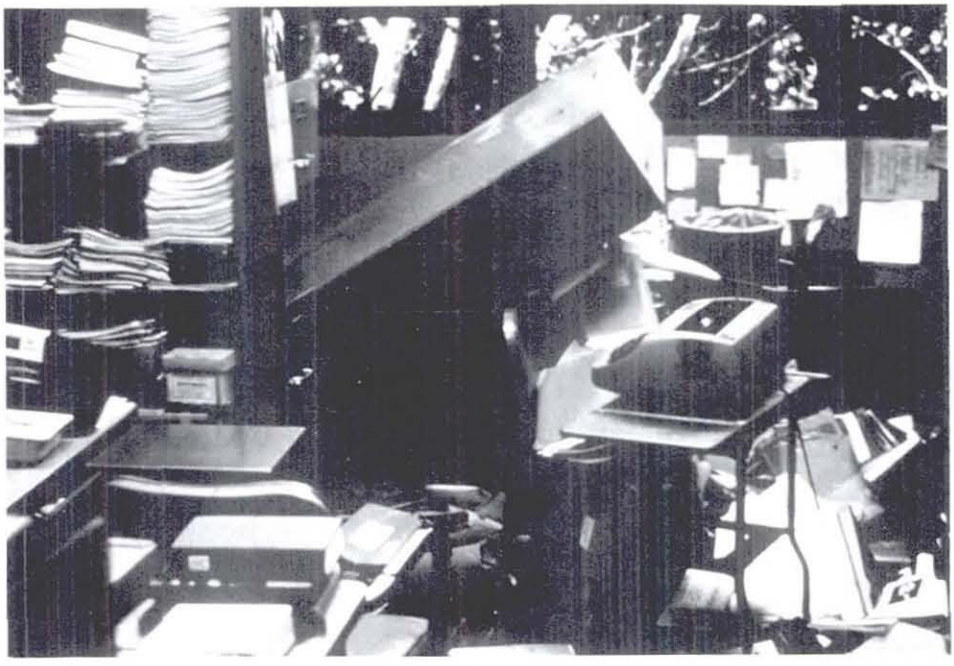
By Henri Koza
Project Manager
EQE Engineering

Classroom and Office Furnishings

- During past earthquakes, bookshelves and filing cabinets have toppled due to lack of restraint.

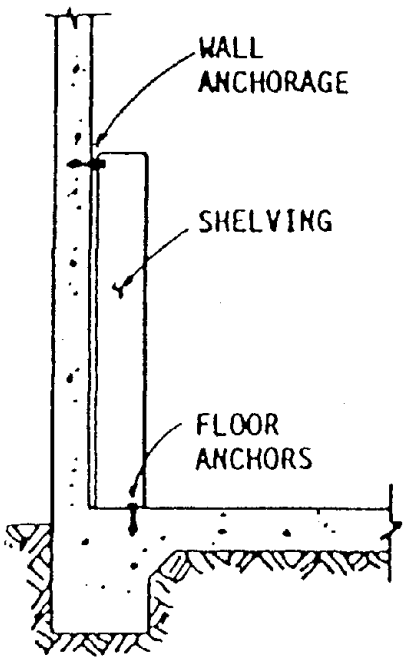
- Contents thrown to floor resulting in disarray, loss of production, loss of service.

- Also possible serious injury to nearby personnel.

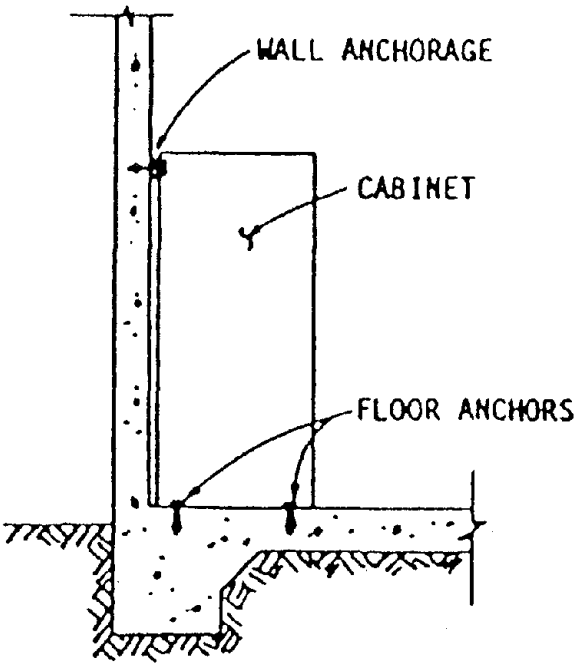


Corrective Measures

- Provide anchorage at top and bottom of those vulnerable units that are adjacent to walls.
- Provide anchorage at bottom of units and connect together free-standing groups of cabinets.
- Size and configuration of anchors dependent on size and weight of shelves and cabinets as well as type of floor and wall systems.
- Table-top mounted items such as typewriters, personal computers, telephones should be secured to tables with "VELCRO" type fasteners.
    - During past earthquakes, these items flew across rooms like missiles.

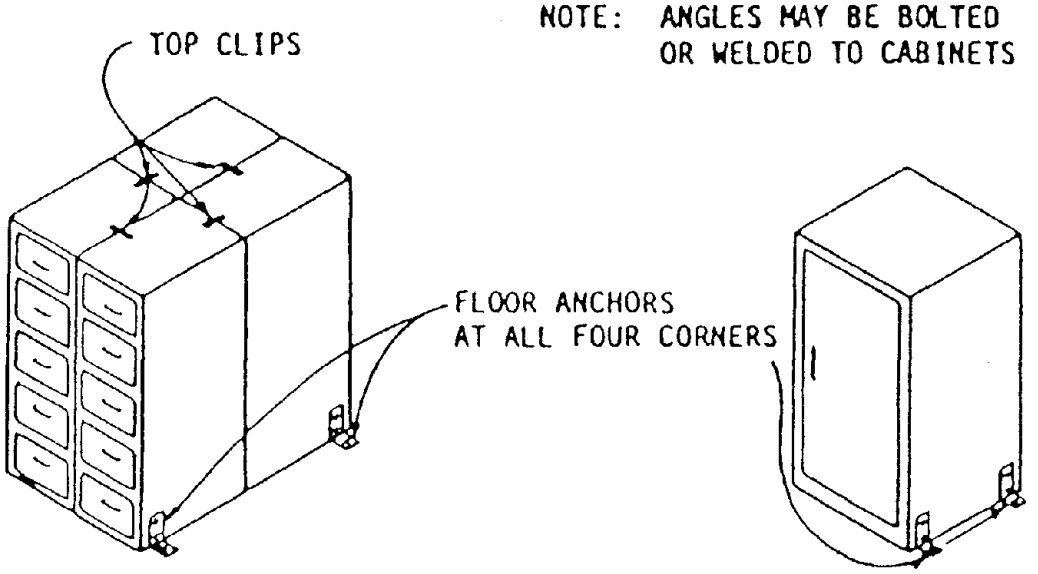


SHELVING WALL ANCHORAGE



CABINET WALL ANCHORAGE

NOTE: ANGLES MAY BE BOLTED OR WELDED TO CABINETS



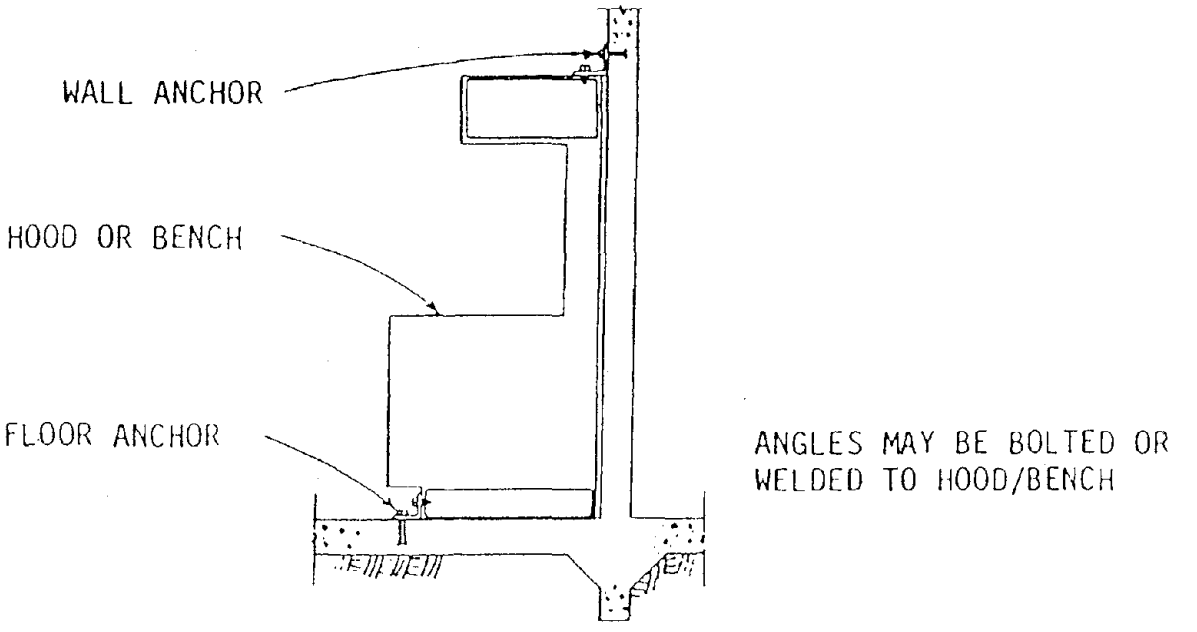
ANCHORAGE DETAILS FOR FREE STANDING CABINETS

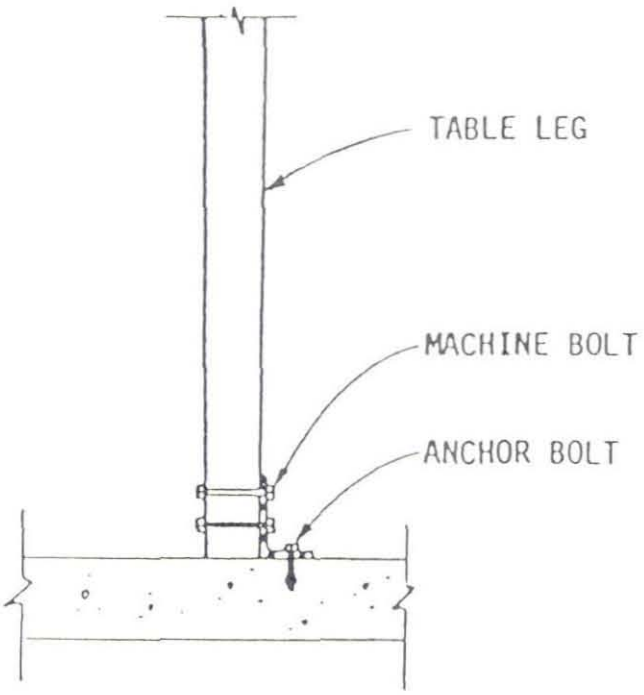
Other Types of School Cabinets

- **Laboratory cabinets, benches, tables, and hoods also need to be restrained.**

- **Same principles for corrective measures apply as for shelving and cabinets:**

  Restrain top and/or bottom of units to prevent sliding and overturning.



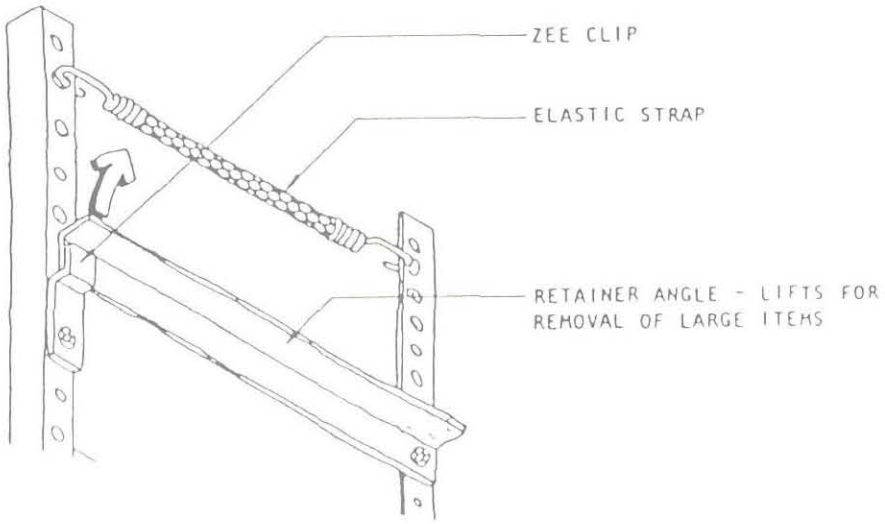


Inventory Shelves and Corrective Measures

- Restrain at top and/or bottom as previously shown.

- Implement use of retainers and elastic straps to minimize potential for inventory/supplies sliding and falling off shelves.

- Used successfully in hospitals to prevent loss of medical supplies.


ZEE CLIP
ELASTIC STRAP
RETAINER ANGLE - LIFTS FOR
REMOVAL OF LARGE ITEMS

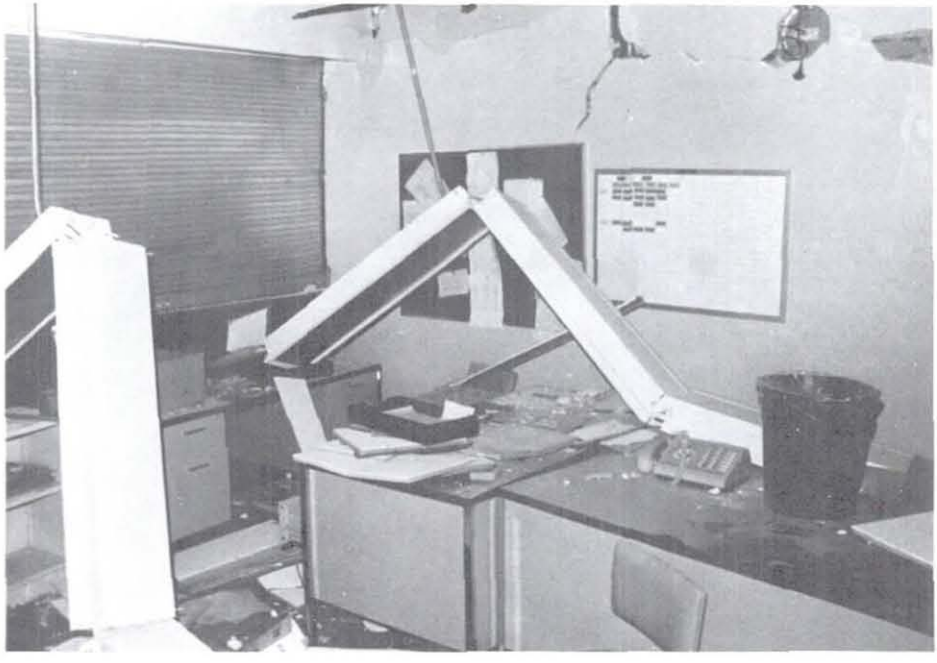
Suspended Ceilings and Light Fixtures

- Many recorded instances where suspended ceilings and light fixtures have been damaged during past earthquakes.

- Exposed-tee-grid systems (comprising about 90% of all installations) have sustained the most damage in the past.

- System sways excessively resulting in damage and/or collapse because of a lack of positive lateral and vertical bracing.

- Falling ceiling tiles and light fixtures can injure personnel and damage sensitive equipment.



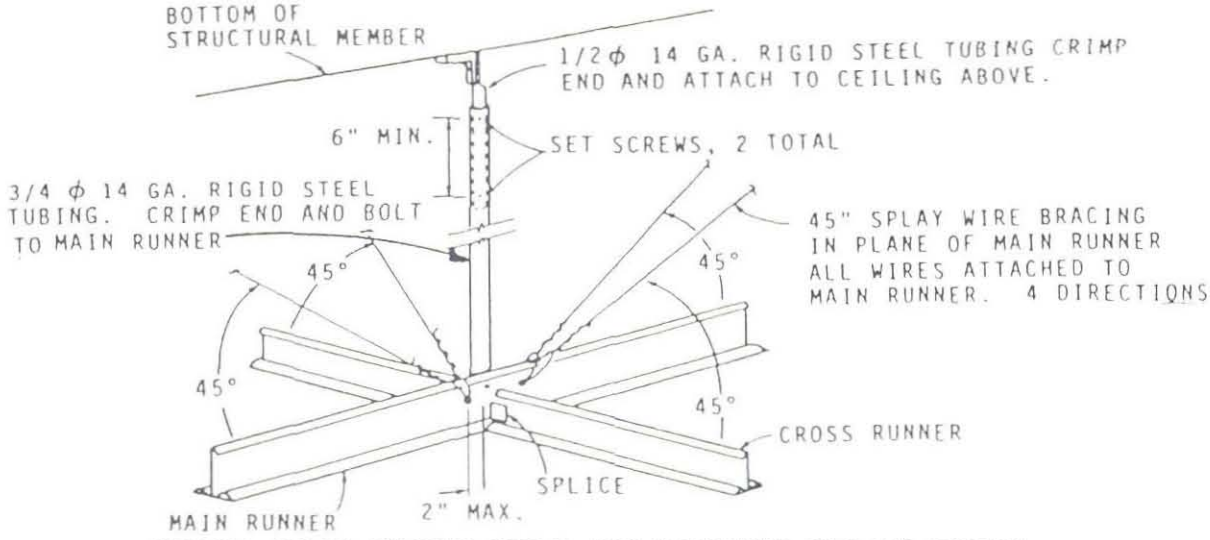
Corrective Measures

FOR SUSPENDED CEILINGS:

- Vertical compression struts to limit vertical displacements.
- Diagonal wires to provide lateral restraint.

FOR SUSPENDED LIGHT FIXTURES:

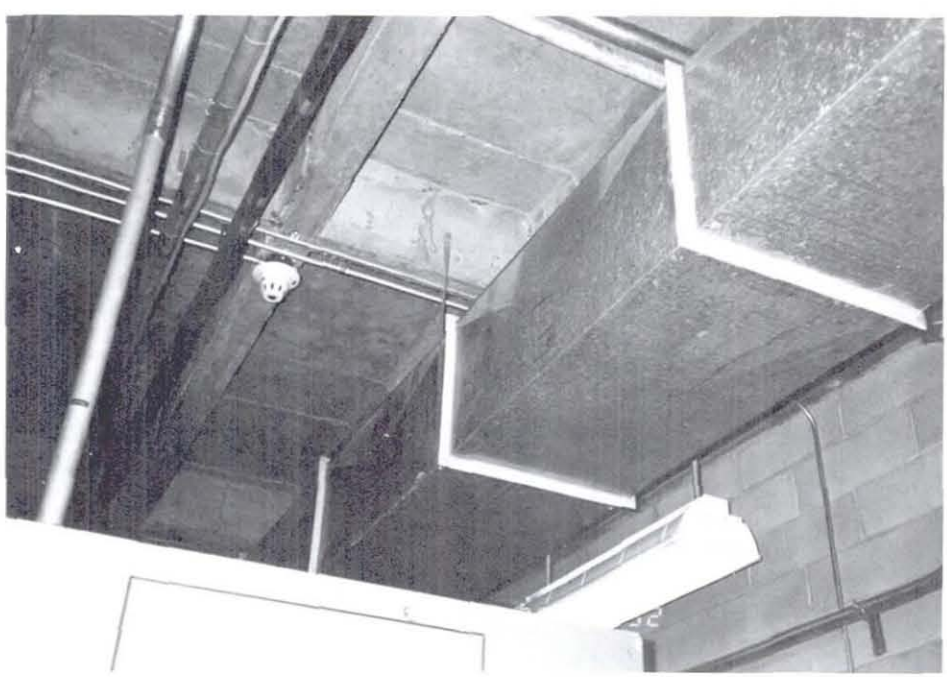
- Vertical wires to support fixtures directly to underside of floor system or ceiling (Do not have lights supported by suspended ceiling grid).



TYPICAL SPLAY BRACING DETAIL FOR SUSPENDED CEILING SYSTEM

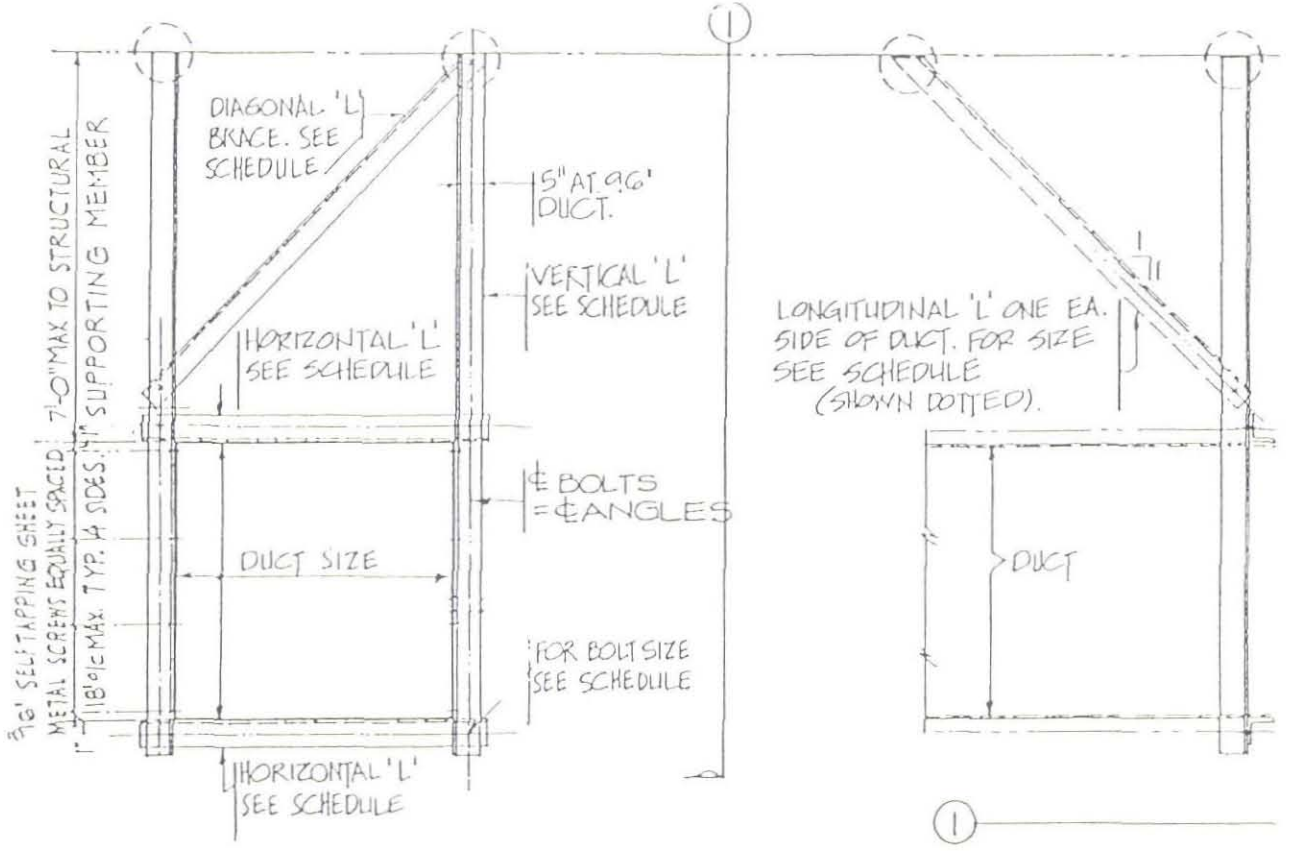
Heating/Ventilation/Air Conditioning Ducts

- Ducts, fans, and plenums are often supported by vertical hangers with no lateral bracing.



Corrective Measures

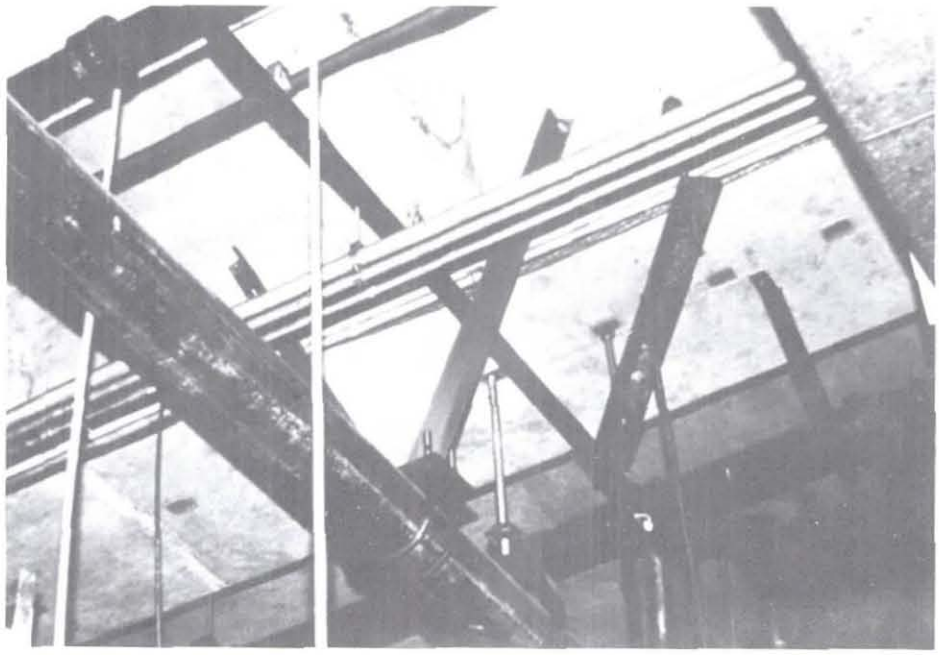
- **Ducts should be braced in both transverse and longitudinal directions to provide lateral restraints.**



Fire Sprinkler and Other Piping

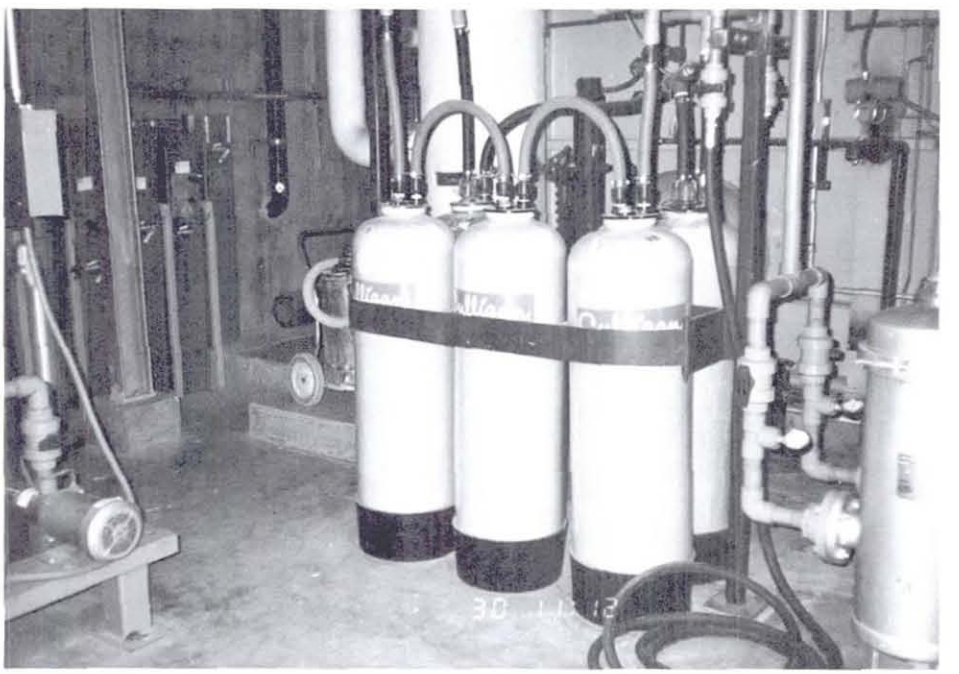
- Requirements that these be laterally restrained contained in "National Fire Protection Association" (NFPA) Code criteria.

- May need supplemental restraints based on judgment and experience from previous earthquake performance.



Tanks (ex. Laboratory Gas Bottles)

- Vulnerable to sliding and overturning.
- Unanchored compressed gas cylinders will tip over at very low levels of ground shaking.
- Damage typically occurs at top of tank resulting in snapping-off of "*reducing valve.*"
- Result is that canister may become a high-speed missile.
- Also escaping gas may present a potential fire, explosion, or toxic gas hazard to nearby personnel.



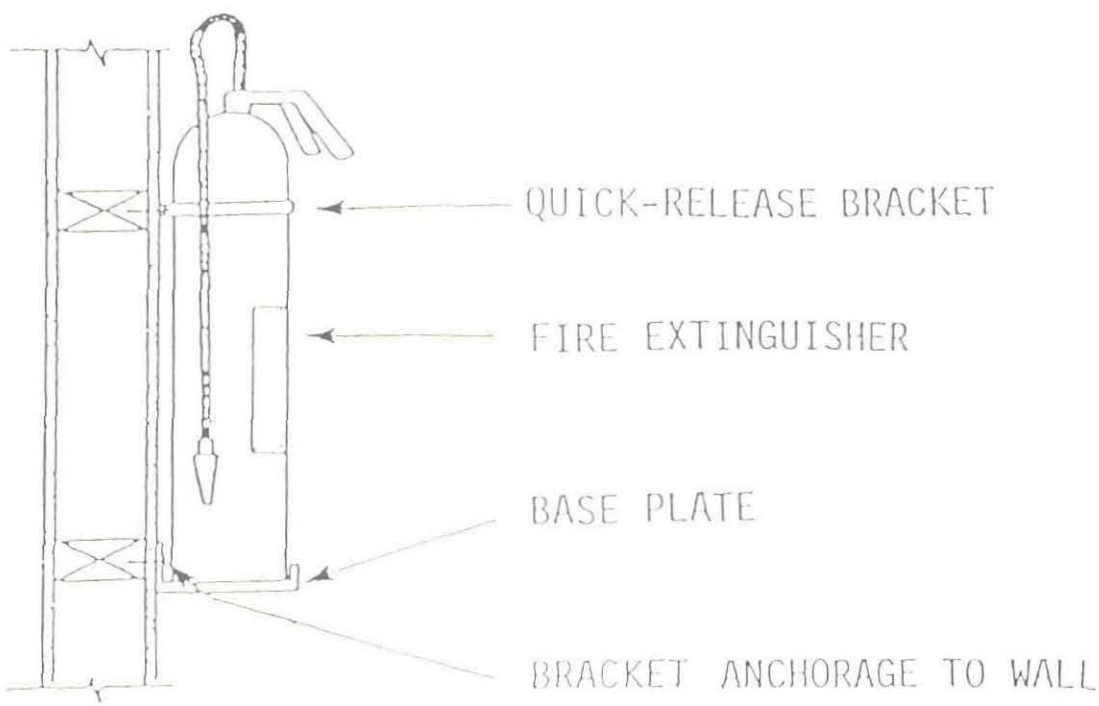
Corrective Measure

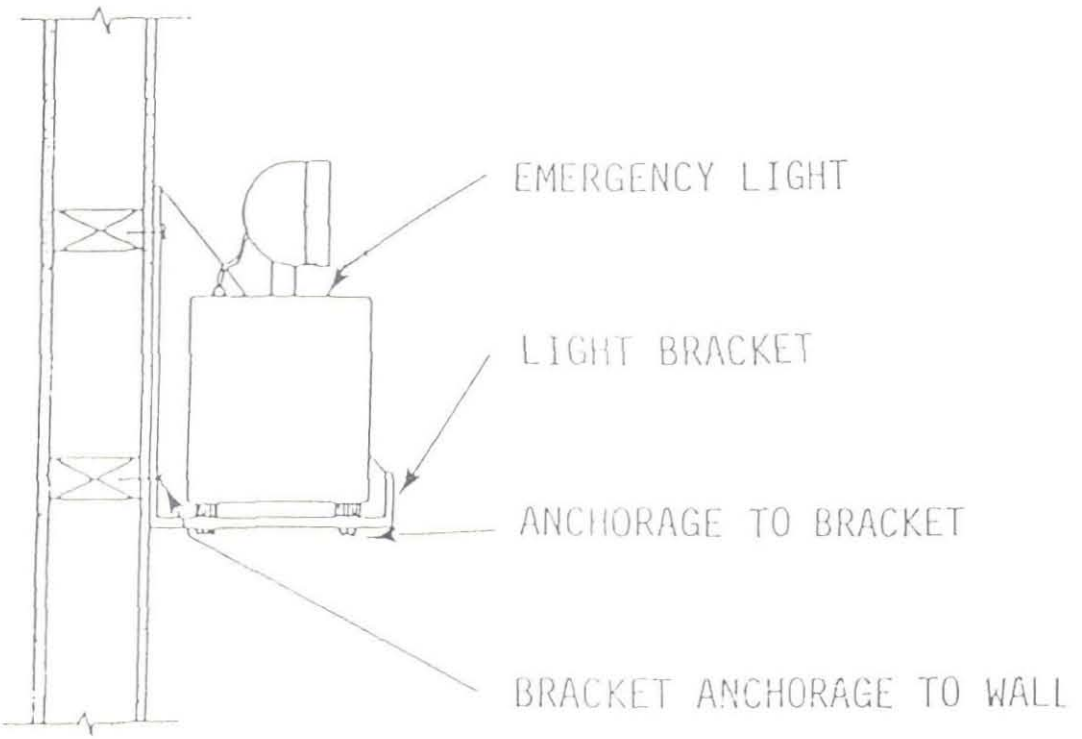
- Tanks should be well-restrained at both top and bottom.

Fire Extinguishers and Other Wall Mounted Items

- Required in case of an emergency, but many times are inadequately anchored, braced, or otherwise restrained.

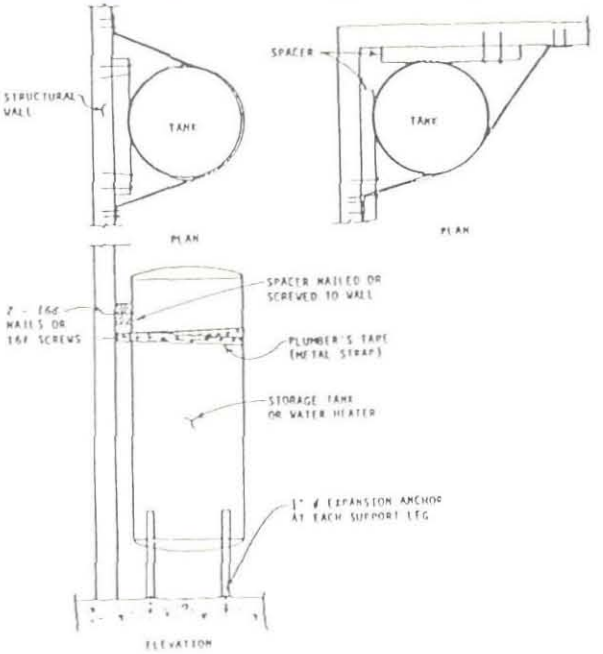
- Corrective Measures:
  - Support brackets need to well-anchored to metal or wood studs (beams, columns) behind wall.
  - Units themselves need to be well anchored to support bracket.





Hot Water Heaters and Similar Units

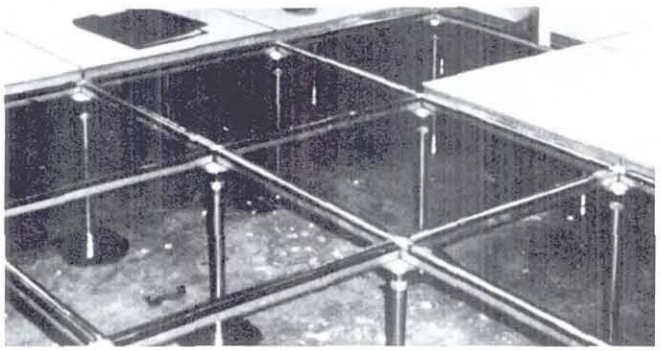
- Heavy units with potential for sliding and overturning.
- Potential for severing of gas line resulting in a fire following earthquake.
- Corrective Measure involves restraining the top and bottom of unit with inexpensive hardware.


STRUCTURAL WALL
TANK
PLAN
SPACER
TANK
PLAN
2 - 16G NAILS OR 16G SCREWS
SPACER NAILED OR SCREWED TO WALL
PLUMBER'S TAPE (METAL STRAP)
STORAGE TANK OR WATER HEATER
1" ø EXPANSION ANCHOR AT EACH SUPPORT LEG
ELEVATION

Computer Facility Floor System

- Vulnerability of raised floor systems
  - Pedestal and stringer systems are weak in resisting earthquake loads, especially if floor height is over about 12 inches.

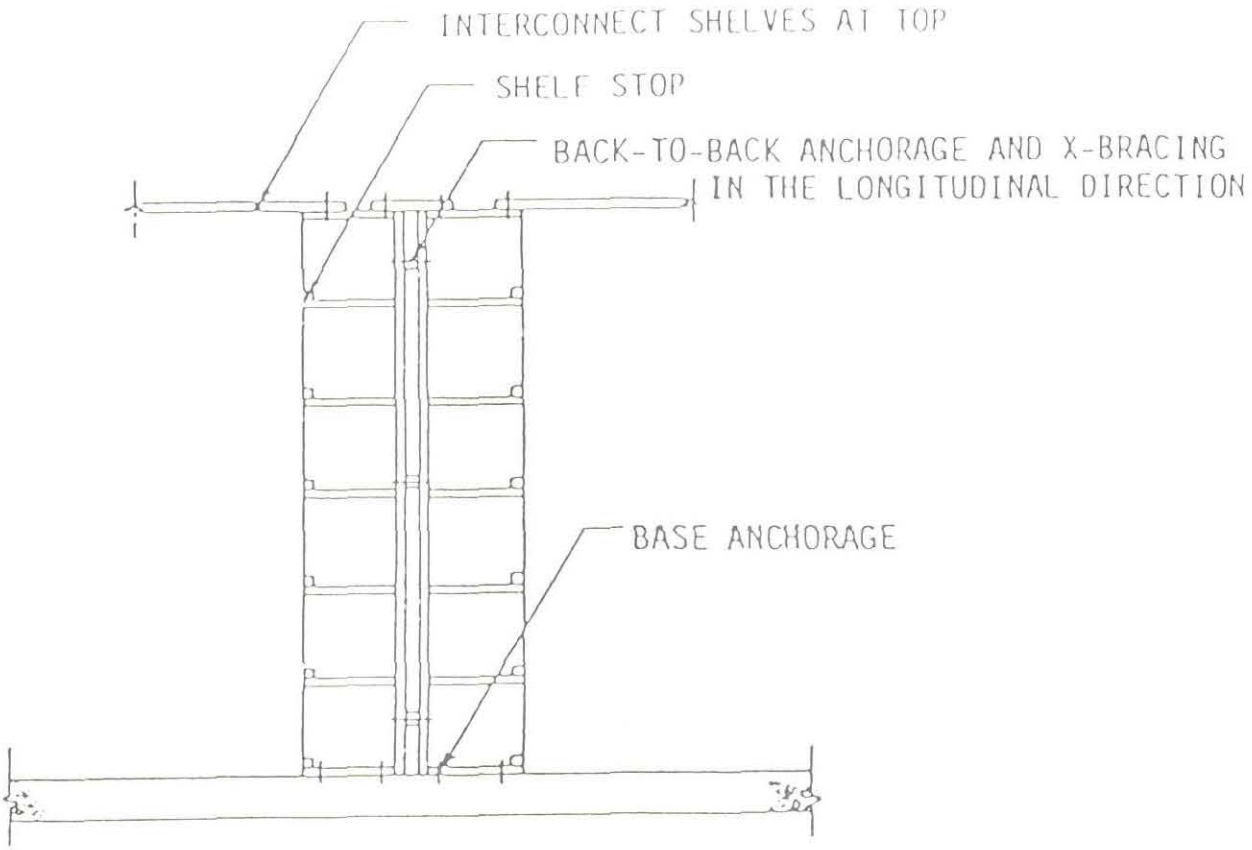
- Corrective Measure involves providing retrofit bracing to laterally restrain the floor system.

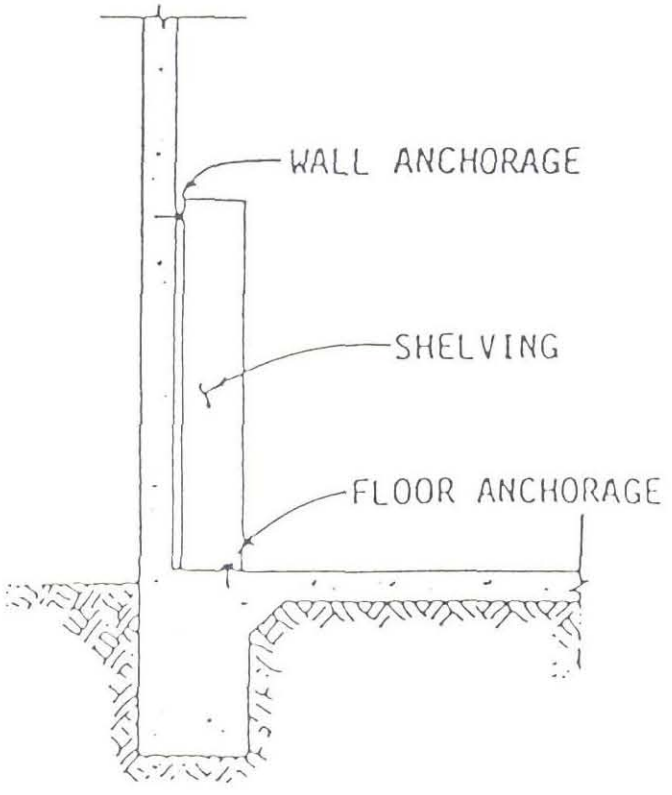


Computer Tape Storage

- Same vulnerability to sliding and overturning as office bookshelves and cabinets.

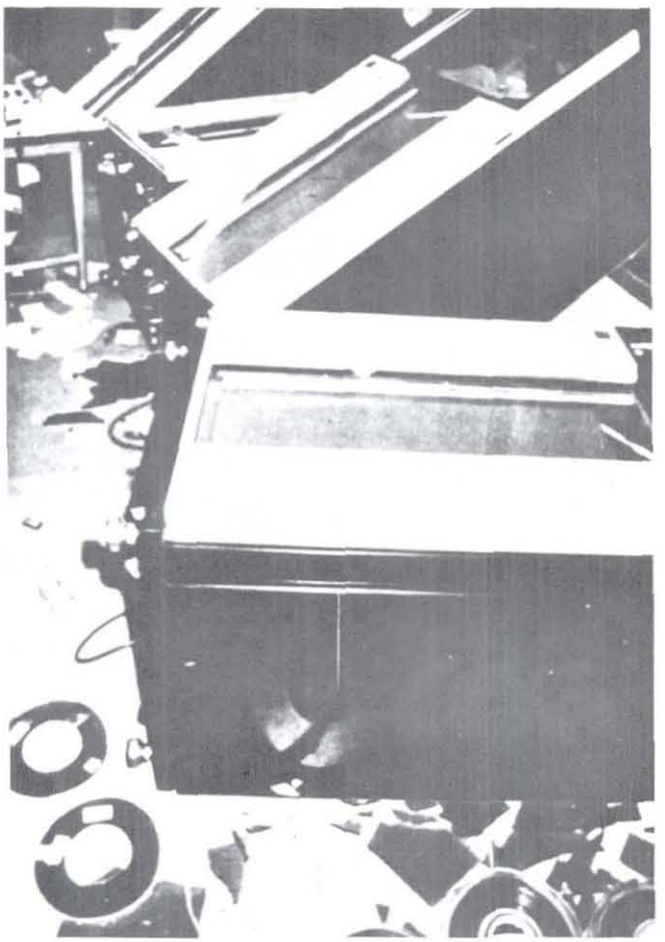
- Corrective Measure involves either grouping together and anchoring shelf units or anchoring top/bottom of units to adjacent wall and floor.

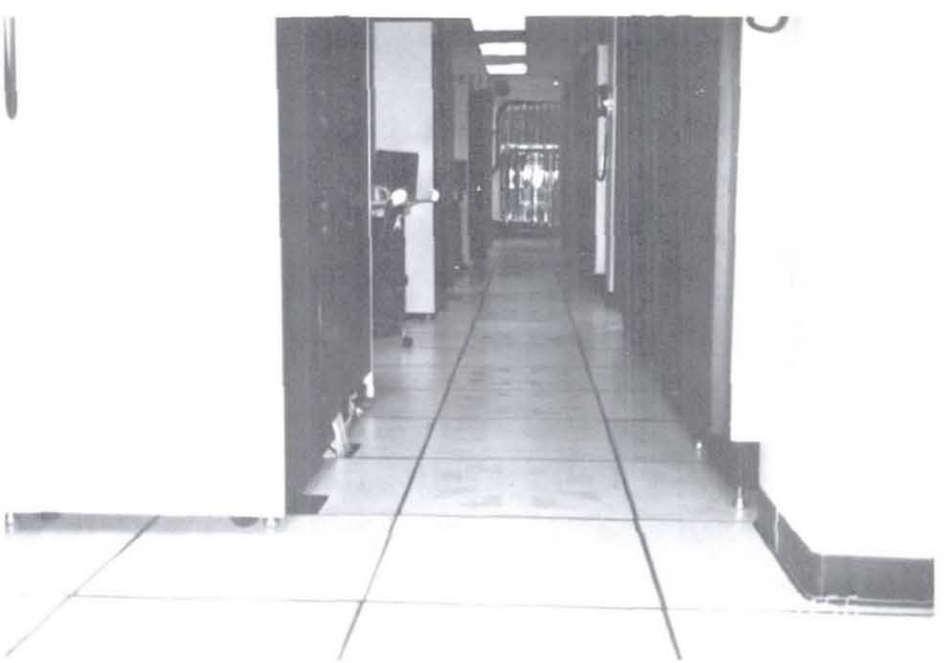

INTERCONNECT SHELVES AT TOP
SHELF STOP
BACK-TO-BACK ANCHORAGE AND X-BRACING
IN THE LONGITUDINAL DIRECTION
BASE ANCHORAGE

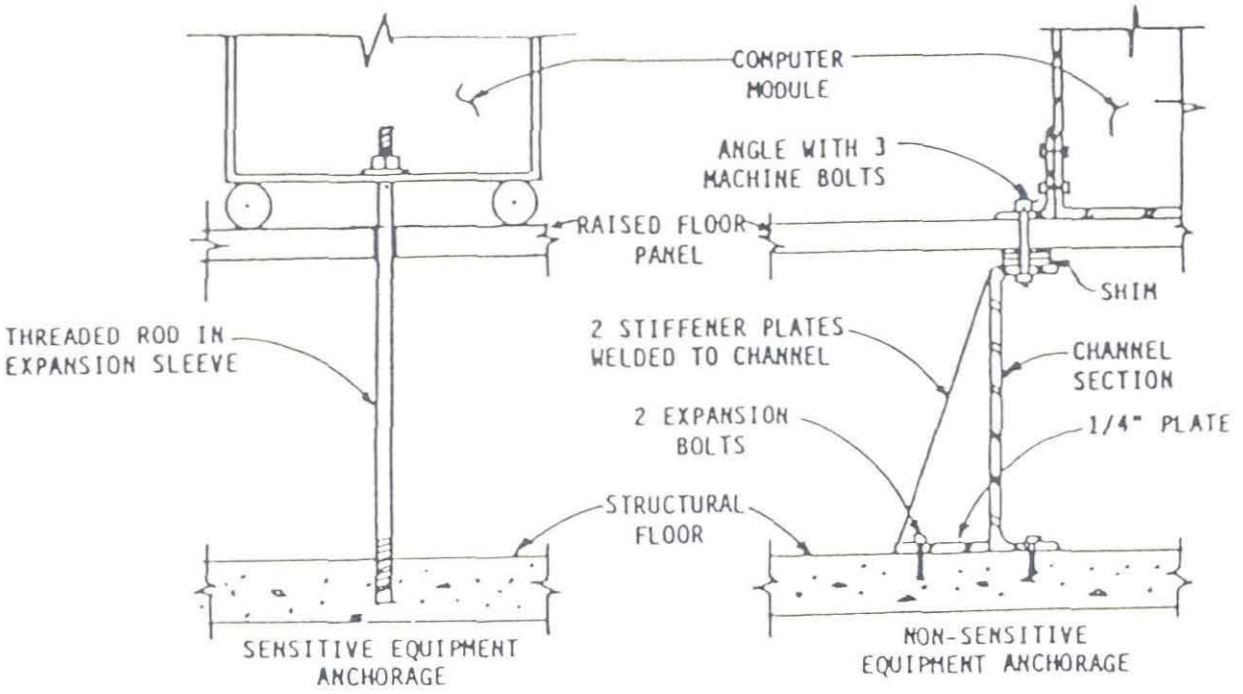


Computer Cabinets

- Vulnerable to sliding, overturning, and collision with adjacent units.
- Most units mounted on leveling screws or roller wheels - especially vulnerable!
- Corrective Measures include securing units directly to concrete floor below raised floor system.







SUMMARY

- Most classroom/office furnishings, equipment, and non-structural items are generally not well-secured or restrained against strong ground shaking.
- These items can be easily damaged and cause injury to nearby personnel.
- Facility downtime can be lengthy as cleanup and re-organization take place - result is loss of service to the community.
- Restraint of such items is a matter of common sense, although anchorage and restraint schemes should be "engineered," otherwise a false sense of security will result.

Science Coordinators

A comprehensive earthquake education program needs to integrate science with safety and preparedness. Therefore, science coordinators and supervisors are an integral part of the earthquake planning and education team. Some of the issues which science coordinators need to address are:

- o Earthquake Hazards Curricula
- o Laboratory Safety
- o Student Response Clubs
- o Ethnicity in Earthquake Response

Earthquake Education Curricula: A Necessary Part of Earthquake Mitigation in the Schools

By Katharyn E.K. Ross
Education Specialist
National Center for Earthquake Engineering Research

Earthquake education has an important role in both school and society. All 50 states are vulnerable to earthquakes and at least 39 of these are subject to moderate or major seismic risk as are the most heavily populated parts of Canada. Millions of people are exposed to significant earthquakes hazards. When the mobility of society is taken into consideration, the number of individuals who may one day experience a damaging earthquake is even greater. In this century, earthquakes in North America have resulted in more than a thousand deaths and billions in property damage. Earthquake education that provides an understanding of the causes of earthquakes, their impacts, and the necessary steps to reduce loss of life and property is essential to our physical and emotional well-being.

Earthquakes have damaged schools. August 31, 1886, damage occurred at Charleston College in an earthquake that killed 60 residents of Charleston, South Carolina. March 10, 1933, in Long Beach, California, the John Muir School on Pacific Avenue and the wall of the dance hall building in Compton High School collapsed. October 31, 1935, the west wing of the new Helena High School collapsed in an earthquake in Helena, Montana; the collapsed part of the school had reinforced concrete frame, floors, and roof, and tile floors faced with brick. August 18, 1959, in Hebgen Lake, Montana, the decorative stone entryway was shaken down at the West Yellowstone Elementary School. Government Hill Elementary School was split in two during the Good Friday earthquake (March 27, 1964) in Anchorage, Alaska.

Structural problems are not the only concern when there is an earthquake. At 4:42 pm on Monday, May 2, 1983, a 6.5 magnitude earthquake struck Coalinga, California. Seconds later there was an after shock of 5.0 on the Richter Scale. A report prepared after this earthquake by E. Robert Bulman for Charles S. Terrell, Jr., Superintendent of Schools for San Bernardino County, California, noted nonstructural damage to the schools. For example, about 1,000 fluorescent light bulbs fell from the fixtures and broke. Improperly installed T-bar ceilings fell as well as glued ceiling tiles. Water pipes located in the basement were broken, flooding the basement and stopping the electrical supply because all the switching mechanisms were damaged by the water. In a second floor chemistry lab in the high school, bottles of sulfuric acid and other stored chemicals fell and broke. Acid burned through to the first floor. Because there was no electrical power to drive the ventilating system, poisonous fumes filled the building. Superintendent Terrell feels that death and serious injury would have resulted had school been in session. This damage could have been minimized had school personnel reviewed and remedied some of the potential hazards prior to this earthquake.

As we look at the total earthquake education picture and review the impact of earthquakes on schools, there is another concern. Children (and sometimes their teachers) may not understand earthquake generating mechanisms or automatically know appropriate responses in an earthquake. Three separate studies involving 91 students in grades K-6, in two geographic areas in the United States have revealed misconceptions about earthquakes, what causes an earthquake, what occurs during an earthquake, and what one should do in an earthquake. Some of their responses are listed below:

An earthquake is:

- a volcano
- an eruption
- an explosion
- the same as a tornado
- a big cloud
- God's way of getting rid of things that aren't supposed to be there
- Mother Earth's temper tantrum
- when the wind blows strong
- an interruption (of television coverage of the World Series)

During an earthquake:

- it gets dark
- it gets foggy
- things whirl around
- plants screw up because the seeds jiggle around
- everything turns really hard
- core and crust hit each other
- it's almost like a hurricane
- everything falls to pieces
- the core lets out air
- planes are pulled out of the air

An earthquake is caused[6] by:

- heat; hot weather
- heat from the sun on the Earth
- the Earth turning the wrong way
- the Earth letting out air; like when we cough or sneeze
- thunder
- rain
- wind
- rocks in water
- Earth's core getting too hot and/or causing pressure
- loud noises
- drilling in the sidewalks
- lava
- Divine retribution
- rumbling in the ground
- the Earth having too much energy and needing to get rid of it; like when we have too much energy and need to get rid of it
- negative emotions being dumped into the Earth
- Toxic waste
- the Earth being scared, upset
- Nobody caring how Mother Earth is feeling
- plates fighting with each other

[6]The cause of an earthquake and knowing what to do in response to such an event were especially difficult for the students in these studies. For example, no student in Study 1 (Ross & Shuell, 1989) mentioned plate movement as a cause of earthquakes.

In an earthquake, you should do the following:

- o go or stay in the basement
- o run
- o hold the pet cages
- o hold on to metal
- o take a plane anywhere
- o go to a place where they study earthquakes and tell them what's happening
- o call the Air Force

In Study 1 (Ross & Shuell, 1989) only 9% of the students gave a clearly correct answer for what to do in an earthquake. Some fourth graders in New York (Ross & Shuell, 1990a, b) specifically mentioned metal when stating that one would be safe in an inside doorway. Probing of this response indicated that some children felt metal would protect them rather than the structure of the building. As one fourth grader stated, "An earthquake doesn't do metal. It does concrete."

Subsequently, a question was added to the "appropriate action" section of an Earthquake Information Test (Ross & Shuell, 1990a), that stated persons should hold on to something metallic. Thirty-three percent of 194 fourth, fifth, and sixth graders from New York and Utah marked this question "true."

There has been structural and nonstructural damage to schools from earthquakes. In addition, some beginning research shows that students have difficulty understanding the science of tectonic processes and applying scientific principles to mitigation strategies. A comprehensive earthquake education plan is needed to help our schools. This plan should incorporate at least three components:

- o Awareness of seismic risk in the particular geographic area
- o Incorporation of accurate scientific concepts about earthquakes in school programs and texts
- o Inclusion of accurate earthquake mitigation strategies into the existing curriculum

To facilitate the incorporation of a comprehensive earthquake education plan, it is imperative that educators are provided with curricular information and background support materials. However, some curricula provide only scientific or safety information. Because a well-balanced earthquake education curriculum is an integration of the two, it is important that the missing half is simultaneously provided. Failure to do so may inadvertently perpetuate misperceptions and result in students viewing science as something separate from daily life.

The following is a brief overview of some existing curricula:

CALEEP Curriculum For grades 4-8
Lawrence Hall of Science

"Mini-Kit" consists of 14 hands-on earthquake education activities:

a. Teacher's Guide - including blackline masters
b. Computer Disk - (Apple II+ and/or IIe with disk drive)
   Quake: A Computer Simulation and Survival: A Computer Simulation Game
c. Filmstrip
d. Audio Cassette Tape - disc jockey, Mr. Pate, experiencing 1964 Alaska Earthquake
e. AAA map California

Await the Quake game may be purchased through the Lawrence Hall of Science Eureka Catalog.

Part IV - Team Players: Defining Your Roles

I Can Make X the Difference — For Primary Grades, written at 4th grade reading level
Utah State PTA

This contains a series of units on a number of areas involving emergency preparedness: fire, earthquake, flood, nuclear war, and weather problems. Each unit is organized according to the same format and includes: a picture of a house in the student's community which becomes a home when each child imagines he lives there; an introductory poem; "What Would I Do" exercises; "Things I Should Know;" and games and puzzles. The earthquake section includes a map showing Utah earthquakes, an earthquake word hunt, and safety rules crossword puzzle.

Crustal Evolution Education Project — Designed primarily for grades 7-12

This consists of 33 individual activity modules designed to provide students with an understanding "of the concepts behind plate tectonics and the physical Earth." Each module is individual, self-contained and designed for the Earth Science classroom. Modules include: "Locating Active Plate Boundaries by Earthquake Data," "Earthquakes and Plate Boundaries," "Plate Boundaries and Earthquake Prediction," "Hot Spots in the Earth's Crust," "Volcanoes: Where and Why?" and "Quake Estate," a board game to be played by two to four students, whose goal is, "to achieve success in net income based on accuracy of assessing earthquake risks" (copyright, 1979).

The CEEP is not intended to be a complete curriculum but designed to supplement any teacher's curriculum.

Earthquake Awareness and Preparedness Curriculum — For grades Pre-K-6, has been used with students up to 8th grade
Junior League of Oakland-East Bay (JLOEB)

This is a one hour curriculum that anyone can pick up and do. It is aimed at elementary students. There is a curriculum guide that provides lessons for each grade level, an **Instructor's Guide** from Environmental Volunteers, Inc., and role playing situations from CALEEP. There are also supporting videotapes that show each level of the curriculum that were prepared by JLOEB, the Albany Unified School District, and The Audubon Nature Training Society: preschool level, middle school, high school-adult (not included in the curriculum), and "School Facilitation." These can be borrowed from BAREPP.

Earthquakes: A Teacher's Package for K-6/FEMA 159 — For grades K-6
Federal Emergency Management Agency

This 280 page curriculum was developed by the National Science Teachers Association. It contains hands-on classroom activities that support virtually all elementary subject areas. Designed for the classroom teacher with little or no background in earth science, the six-unit package focuses on defining an earthquake, why and where earthquakes occur, physical results of earthquakes, measuring earthquakes, recognizing an earthquake, and earthquake safety and survival.

**Currently, there are plans to also develop "earthquake" theme hands-on classroom activities for grades 7-12 in supplements to Physics, Earth Science, Geometry, Trigonometry, and Calculus.

Earthquakes (Module) For grades 8-10
"Minorities in Engineering" Project

This is a module designed to interest students in earthquakes through activities, modeling, engineering applications, and simulation strategies. It has 12 lessons: 1-5 introduce students to earthquakes; 6-9 talk about observed precursors of earthquakes and introduces seismograms; and 10-12 try to make earthquake investigation relevant to students. Includes directions for making related items and doing experiments, i.e. making your own tiltmeter, creepmeter, shoebox model of a fault simulator, liquefaction simulation, resonating building demonstration, and earthquake simulation. Includes reproducible charts and maps. Can be used in part or total in an earth science or general science course.

**NCEER has been given permission to reproduce copies of this module on request.

Hands-On Earthquake Learning Package
Environmental Volunteers

1. Instructor's Guide
   a. 17 illustrated, plastic-protected Activity Folders
   b. 16 information/activity inserts (including quake myths, games, puzzles, math activity, "tremor tales").
   c. Illustrated text on basic earthquake geology: **The Story of the Earth**
   d. **Red Cross' Safety and Survival in an Earthquake**
   e. "Getting Ready for a Big Quake" - **Sunset** magazine
   f. Complete guide to school earthquake planning
   g. Neighborhood Preparedness Guide
   h. "Plans for the Teaching Materials"

2. Hands-on Teaching Materials
   a. Plate Tectonics Globe (removable plates)
   b. Earth Hemisphere Model
   c. Plate Puzzle map (ocean floor features)
   d. Wood Plate/Fault Blocks
   e. 9 ft. sq. plate tectonics rug (pattern also available)
   f. Sea Floor Basalt rock sample
   g. Sea Floor Spreading box
   h. Time cards, markers and time-tape
   i. Continental Drift film (computer-generated)
   j. Fault Zone Model
   k. Magni-tube Model
   l. Motor driven shaking table and accessories

I. Science MaTe Program For grades K-6
(Integrating Math, Science and Technology)
Math Science Nucleus

One theme in this master science curriculum is the "Plate Tectonic Cycle - Earth's Moving Force." It is 259 pages with 72 lesson plans including 28 innovative hands-on lab activities. In this cycle, students learn that the Earth is dynamic as it spins on its axis, revolving around the sun. The Earth is restless inside, as it tries to cool its interior. The crust of the Earth is pulled and pushed causing earthquakes and volcanoes along the boundaries of plates. Hands-on activities teach students how scientists investigate the Earth by looking at data derived from earthquakes and volcanoes and to think about present theories about why the Earth's surface moves.

Northwest Earthquake Workshop for Teachers (N.E.W.T.)
Washington State Division of Emergency Management

Not organized by grade level

The goals of this curriculum are to promote a better understanding of science processes through investigation of earthquake phenomenon and to promote scientific literacy. Within each section there are activities organized from simple to complex. Concepts include some related to the behavior of structures during earthquakes.

Teaching Earthquake Safety in the Elementary Classroom
Utah Museum of Natural History

For grades K-3

A 1/2 hour session gives children basic earthquake information utilizing simple activities, myths and factual information. It includes the Kamchatka Myth poster (originally obtained from CALEEP), Wasatch Fault poster and five follow-up activities (adapted from CALEEP to reflect the Utah scene). A Fault Blockset available from NASCO science is recommended. This curriculum is easily adaptable for general use outside of Utah. Note: Utah Museum of Natural History currently only source for CALEEP's Kamchatka Myth Posters.

Utah Geologic Hazards
Utah Museum of Natural History

For Grades 4 - Senior High School

This includes a two-part slide presentation and a two foot square model of a section of the Wasatch Front. Part I - encompasses mountain leveling processes of rockfall, landslide, mudflow, flood, and lake level rises. Part II - includes mountain building process-earthquake. It gives a general explanation of earthquakes, reviews the situation in Utah and what could happen in a major earthquake. This is followed by an earthquake safety session. Follow-up activities on earthquake safety are left with the classroom teacher. These were adapted from CALEEP materials to reflect the Utah scene.

Conclusion

Earthquakes are an international problem that require everyone's attention. An on-going earthquake education program incorporated into all grade levels will provide a continually developing foundation of science and safety information for students and staff tailored to their learning and emotional needs. Students of all ages must be able to take self-protective actions during an earthquake. Factual information on the science of earthquakes will help place the need for learning safety actions within the context of naturally occurring phenomena like weather, will help dispel common misperceptions that could inadvertently result in physical and emotional harm, and will help build a future population of knowledgeable adults capable of making decisions concerning appropriate policies needed to reduce earthquake hazards.

References

Ross, K. E. K., & Shuell, T. J. (1989, October). Children's beliefs about earthquakes. Paper presented at meeting of the Northeastern Educational Research Association, Ellenville, NY.

Ross, K. E. K., & Shuell, T. J. (1990a, November). The earthquake information test: Validating an instrument for determining student misconceptions. Paper presented at meeting of the Northeastern Educational Research Association, Ellenville, NY.

Ross, K. E. K., & Shuell, T. J. (1990b). After Loma Prieta - what do children outside of California believe about earthquakes? Unpublished manuscript.

Selected List of Resource Organizations

Organization:	Source For:
American National Red Cross Disaster Services 18th and E Street N.W. Washington, D.C. 20006	Variety of disaster materials
Arkansas Office of Emergency Services P.O. Box 758 Conway, AR 72032 (501) 329-5601	"Ready Teddy" tape, "Rumble, Tumble Ready" buttons, (K-3) Braille translations of FEMA earthquake booklets
Bay Area Regional Earthquake Preparedness Project (BAREPP) MetroCenter 101 8th Street Suite 152 Oakland, CA 94607 (415) 540-2713	Earthquake Planning and Preparedness Activities for Childcare Providers
California Earthquake Education Project Lawrence Hall of Science University of California Berkeley, CA 94720 (415) 327-6017	CALEEP materials including "Earthquake Hazards Around the Home" coloring book
Center for Earthquake Research and Information Memphis State University Memphis, TN 38152 (901) 678-2007	Reprints of articles related to seismographs, the Earthquake Education Project and New Madrid Seismic Zone
Center for Earthquake Studies Southeast Missouri State University One University Plaza Cape Giradeau, MO 63701-4799 (314) 651-2000	New Madrid Earthquake by Fuller (reprint) "How to Build and Use Your Earthquake Liquefaction Model" The Effects of Earthquakes in the Central United States
Earthquake Education Center Charleston Southern University 9200 University Blvd. P.O. Box 10087 Charleston, SC 29411 (803) 863-7531	"Emergency 'Q' Tips" 1 & 2 Information about earthquakes in South Carolina

Emergency Management Division City of Irvine One Civic Center Plaza Irvine, CA 92713 (714) 724-7149	Officer Ollie's Earthquake Show - videotape; Zoo Friends Earthquake Safety Tips; videotapes of school preparedness workshops
Emergency Preparedness Canada Public Information 2nd floor, Jackson Building 122 Bank Street Ottawa, Ontario Canada K1A 0W6 (613) 991-7077	Earthquakes in Canada videotape; also emergency preparedness booklets in French & English
Environmental Volunteers 2448 Watson Court Palo Alto, CA 94303 (415) 424-8035	Hands-On Earthquake Learning Package with hands-on teaching materials including motor driven shaking table
Federal Emergency Management Agency Earthquake and Natural Hazards Division SL-NT 500 C Street, S.W. Washington, D.C. 20472 (202) 646-2800	Guidebook for Developing a School Earthquake Safety Program (FEMA 88), Earthquakes: A Teachers Package for K-6 (FEMA 159) Big Bird Get Ready for Earthquakes (CTW)
Geological Survey of Canada 601 Booth Street Ottawa, Ontario Canada K1A 0E8 (613) 995-5745	References on Earthquakes; Tectonics, Maps and Earthquake occurrences
Lafferty & Associates, Inc. 4529 Angeles Crest Hiway Suite 215, P.O. Box 1026 La Canada, CA 91011 (818) 952-5483	Preparedness handbook; videotapes: Shake, Rattle and Roll, How to Survive a Major Earthquake
Math/Science Nucleus 3710 Yale Way Fremont, CA 94538 (415) 490-MATH	Plate Tectonic Cycle curriculum (K-6)
Ministry of Education 620 Superior Street Victoria, B.C. Canada V8V 2M4 (604) 356-7821	Seismic Upgrading for School Buildings; School Earthquake Safety Guidebook

National Center for Earthquake Engineering Research State University of New York at Buffalo Red Jacket Quadrangle Buffalo, NY 14261 (716) 636-3391	Earthquake Education Materials for Grades K-12 Fact Sheets Earthquake Engineering Publications
National Research Council of Canada Institute for Research in Construction Building M-22, Montreal Road Ottawa, Ontario Canada K1A 0R6 (613) 993-2607	Earthquake Building Codes; Guidelines for Building
Quake Safe 700 State Dr. Los Angeles, CA 90037 (213) 744-2008	Newsletter, programs for children
Seismological Society of America 201 Plaza Professional Building El Cerrito, CA 94530 (415) 525-5474	"A Catalog of Earthquake Related Sounds" - tape with 21 entries
Southern California Earthquake Preparedness Project (SCEPP) P.O. Box 50310 Pasadena, CA 91115-3010 (818) 795-9055	Pre-School Earthquake Preparedness Guide
University of British Columbia Centre for Human Settlements 2206 East Mall Vancouver, B.C. Canada V6T 1W5 (604) 228-5254	Catalog of Emergency Preparedness and Earthquake Information
University of California at Los Angeles (UCLA) Extension 10995 Le Conte Avenue Suite 639 Los Angeles, CA 90024-2883 (213) 825-4191	Videotapes, Certificate Program and Classes in School Earthquake Preparedness
U.S. Geological Survey Public Inquires Office 302 National Center Reston, VA 22092 (703) 648-6891	References on earthquakes; catalogs, maps of earthquake occurrences

Earthquake Education Within State Science Frameworks

By Joyce R. Blueford, Ph.D.
Geologist
Math Science Nucleus, Fremont, California

There are many demands on the public educational system in the United States. Legislative and board directed initiatives sometimes end in non-compliance because school district personnel are not able to fit the material into their schedule. In many states, there are satellite programs that are funded to solve specific problems that have not been tied into district objectives, which fade into disuse when the budget is cut. Earthquake education is one of those extra curricula materials in this country. Few districts have it written into their district objects, and hence, teachers are not required to teach it. Earthquake education, including scientific background and preparedness can be built into a core science curriculum, if it takes into account the needs of a particular state and district.

Developing a core science curriculum for Kindergarten to Eighth Grade must take into account the specific state science framework. In many cases, Earthquake Education would scientifically fit under Earth Science. State science guidelines usually give districts the flexibility to incorporate a variety of content materials. District curriculum directors must be aware of how to incorporate existing materials into their district objectives. This talk will highlight the Ravenswood City School District in the San Francisco Bay area and how they developed a science core curriculum using the Integrating Science, Math, and Technology Curriculum (I. Science MaTe) as a model. The district curriculum not only follows state science guidelines but also incorporates hands-on lessons for earthquake preparedness.

Developed by scientists and educators together, the I. Science MaTe Curriculum and Program gets an entire elementary school involved with science. It is not an added program, but an integration and coordination of materials used by all teachers at a school. Science is actually a way of thinking, using current materials from the different science disciplines to illustrate major underlying themes. The I. Science MaTe curriculum was designed to allow a school to build a program that is tailored to that specific school.

The "Plate Tectonic Cycle - Earth's Moving Force" is part of the I. Science MaTe curriculum. It consists of 72 lesson plans including 28 hands-on lab activities for students in grades K-6. In the Plate Tectonic Cycle, students learn that the Earth is dynamic as it spins on its axis, revolving around the Sun. The Earth is restless inside, as it tries to cool its interior. The crust of the Earth is pulled and pushed causing earthquakes and volcanoes along the boundaries of plates. Hands-on activities teach students how scientists investigate the Earth by looking at data derived from earthquakes and volcanoes and to think about present theories about why the Earth's surface moves. Learning about earthquakes and volcanic hazards will help children to understand disasters that sometimes occur.

The following is an example of one week of activities from a four week program on the Plate Tectonic Cycle for the 5th grade. Units that were taught before this week were one week on Earthquakes and one week on Volcanoes. A one week unit on Hazards will follow this lesson.

In the 4th grade, students would have looked at material that is slightly lower level than the 5th grade. The 6th grade material would go to a higher level.

PLATE TECTONIC CYCLE - PLATE TECTONICS (5)

PRE LAB *time: 50 minutes*

OBJECTIVE:

1. Exploring how the crust moves.
2. Investigating the patterns produced by volcanoes and earthquakes.

VOCABULARY:

plate tectonics
crust
mantle
core
lithosphere
asthenosphere

PROCEDURE:

MATERIALS: physiographic globe showing cross section of Earth, world map

The Earth is divided into an inner core, outer core, mantle, and crust. The radius of the Earth is 6371 km (inner core = 1200 km; outer core = 2200 km; mantle =2900 km; and crust is 71 km). The physiographic globe illustrates this well.

The crust is the outermost shell of the Earth and contains rocks that are less dense than any other part of the Earth. The mantle is the largest division, between the core and the crust. Rocks in the mantle are capable of slow movement and composed of a variety of heavy (dense) minerals. The outer core is between the inner core and mantle and composed of mainly iron and nickel in a liquid state, plus other heavy elements. The inner core is the innermost and composed of solid iron and nickel. Remember that the composition of the inner part of the Earth is not yet proven. Geologists and seismologists, by experimenting with earthquake waves, have interpreted the data and concluded that the layers have these compositions. Emphasize with students that we cannot even drill through the crust!

Earthquakes and volcanoes define a certain pattern on the earth's crust. This pattern along with other evidence suggests that there has been crustal movement of portions of the Earth called plates. This movement causes release of stress in the form off earthquakes and volcanoes. It was not until the mid 1900's that scientists started to advocate the plate tectonic theory which states there are 3 types of plate motion.

(1) The crustal plates of the earth are colliding or converging.
(2) The crustal plates of the earth are spreading or diverging.
(3) The crustal plates or the earth are slipping by one another (transform).

Show students a map of volcanoes and earthquakes that occur on the surface of the Earth. The U.S. Geological Survey publishes several maps that may be useful (see further references). In plate tectonics the rigid crust and the upper part of the mantle (lithosphere) moves together as a unit. The lithosphere "rides" on what is called the asthenosphere or a more viscous part of the upper mantle. Ask them if they think there may be another way to explain this crustal movement. Can the earthquakes and volcanoes be caused by an expanding or contracting Earth?

PLATE TECTONIC CYCLE - PLATE TECTONICS (5)

DURING LAB time: 50 minutes

OBJECTIVES:

1. Testing 3 theories to explain crustal movement.
2. Experimenting with materials to make mountains.

VOCABULARY:

mountain building
contracting
expanding

PROCEDURE:

MATERIALS: round balloons, flour, water, lab sheet, wax paper, aluminum foil

Geologists general accept plate tectonics as a theory that models the movement of the Earth's crust. There are specific physical features on the Earth that gives one clues that there are pressures within the lithosphere. Parallel mounts and valleys are evidence of compression, but you get similar patterns not only by plate tectonics but by a contracting or expanding Earth. Not all features on the Earth can be totally explained by any of the models, for instance the Hawaiian volcanoes are difficult to explain.

This lab illustrates whether or not plate tectonics is a good theory to explain the movement of the Earth's lithosphere. Go over the lab sheet with students by demonstrating the lab procedures.(Follow students lab sheet). Tell the students that the experiment is to be done slowly and that they are to think about what they are doing and what is happening. Have them record their findings.

Go over the student's results. Focus on Theory 3 so that they get an understanding of mountain building, earthquakes, and volcano formation as they relate to crustal movement. There are many reasons why the contracting and expanding earth theories are not suitable. They really do not fit all the data that geologists have accumulated over the years. Geologist can measure the earth's diameter, and the Earth does not seem to have gotten larger nor smaller. Students should discuss various tests. Even if they come up with some silly answers, it gets them thinking about the pros and cons of the different models.

On theory 1 and 2 students are using the flour mixture to simulate the lithosphere (crust and upper mantle) moving on top of the balloon (asthenosphere). Students can try and be realistic about making continents out of the flour mixture. In the expanding earth the four mixture will move apart, making cracks and wrinkles that are parallel. Contracting earth will have the lithosphere moving together causing parallel mountains and valleys. Plate tectonics will also give you parallel features. (Consult the article at the beginning of manual for more information.)

On theory 3, the arrow refers to the motion of pressure. On 1, students should squeeze a a piece of aluminum foil first with equal pressure from both hands and then with one hand exerting more pressure. In 2, students move one hand diagonal down while the other hand goes diagonal up. This would be similar to movement on the San Andreas fault in California. 3 and 4 represent a more realistic model of the Earth where you have different densities of rock, which act differently with stress. Key observations are the creation of parallel mountains and valleys.

PLATE TECTONIC CYCLE - PLATE TECTONICS (5)

PROBLEM: What theories can explain volcano and earthquake distributions?

PREDICTION: _____

THEORY 1. EXPANDING EARTH

Blow up a balloon 1/2 way. Make a pasty mixture of flour using approximately 1/4 cup water and 2 heaping teaspoons of flour. As one partner holds the balloon, the other partner will put a thin coating of mixture on about 1/4 of the balloon. Then, one of the partners slowly blows up the balloon; record what happens.

_____

_____

THEORY 2. CONTRACTING EARTH

Clean the balloon, and blow up the balloon completely. Use the flour mixture to model the continents. Then, deflate the balloon slowly and record what happens.

_____

_____

THEORY 3. PLATE TECTONIC

Describe what happens when you apply equal or unequal pressures with your hands as charted below. Your instructor will clarify the diagrams.

Al = aluminum; w = wax paper; ↑ = hand movement

	1 → Al ←	2 ↑ Al ↓	3 → Al ← W Al	4 ↑ Al W Al ↓
EQUAL PRESSURE				
UNEQUAL PRESSURE				

CONCLUSION: Which theory do you like and why?

_____

_____

PLATE TECTONIC CYCLE - PLATE TECTONICS (5)

POST LAB **time: 50 minutes**

OBJECTIVES:

1. Making a model of the Earth.
2. Defining the boundaries of the plates.

VOCABULARY:

crust
plates
plate movement

PROCEDURE:

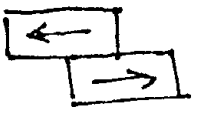
MATERIALS: Tetrahedron map by NGSDC, paste, scissors, crayons

Copy the master sheet onto hard stock paper (50 lb or heavier is ideal, but 20 lb paper will work). Pass out the sheets and have the students color portions of the Earth to help distinguish the land from the oceans. See if they can define "plates" using the data. Ask them to draw the plate boundaries. Ask them the same question after they put it together. It is much easier to see the plates when it is put together.

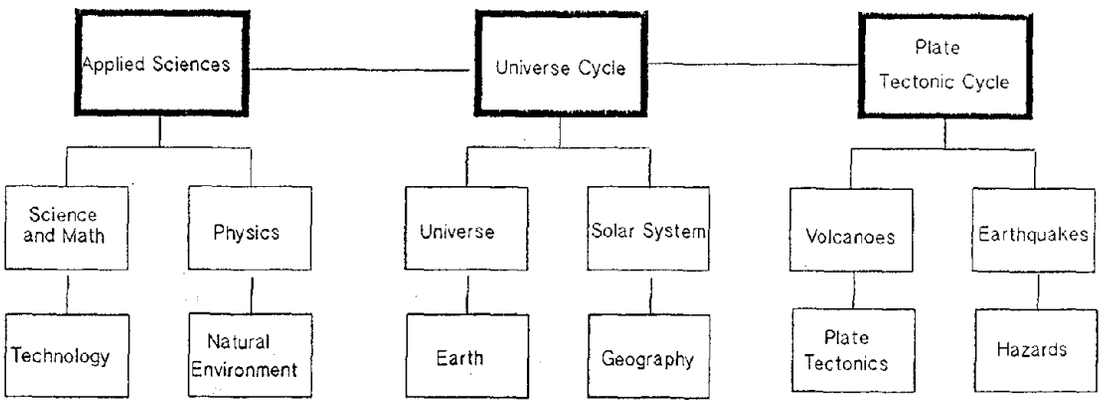
Have them cut out the world and paste the appropriate areas. Tell them how to fold all the black lines before they start to paste, otherwise it is difficult to put together.

This map was designed and programmed by John Ward of the National Geophysical and Solar Terrestrial Data Center (NGSDC). The NGSDC acquires, reformats, archives, and distributes worldwide seismological data, many in cooperation with the U.S. Geological Survey. The earthquakes that are plotted on this tetrahedron map were retrieved from the Earthquake Data File for the years 1963-1974 and had magnitudes of 4.5 or greater.

Discuss with students the 3 different plate boundaries by using the illustration below. Differentiate for students which boundaries produce earthquakes and/or volcanoes.

TYPE OF PLATE BOUNDARY		PRODUCES
converging (side view)		volcanoes and earthquakes
diverging (side view)		volcanoes and earthquakes
transform (top view)		earthquakes

COMPARING COMPONENTS OF INTEGRATING SCIENCE, MATH, AND TECHNOLOGY (K-6) WITH THE CALIFORNIA STATE SCIENCE FRAMEWORK, 1990



CORRELATION TO CALIFORNIA'S STATE SCIENCE FRAMEWORK, 1990

APPLIED SCIENCES

CONTENT

* REACTIONS AND INTERACTIONS
* SOURCES AND TRANSFORMATIONS
* HEAT
* ELECTRICITY
* LIGHT
* SOUND

THEMES

* ENERGY
* SCALE AND STRUCTURE
* SYSTEMS AND INTEACTIONS

PROCESS SKILLS

* APPLYING
* INFERRING
* OBSERVING
* COMMUNICATING
* RELATING

ADDED FEATURES

* INVENTIONS
* BIOGRAPHIC HIGHLIGHTS
* TECHNOLOGY

UNIVERSE CYCLE

CONTENT

* ASTRONOMY
* GEOLOGY AND NATURAL RESOURCES
* FORCE AND MOTION

THEMES

* ENERGY
* EVOLUTION
* PATTERNS OF CHANGE
* SCALE AND STRUCTURE
* STABILITY

PROCESS SKILLS

* COMPARING
* INFERRING

ADDED FEATURES

* GEOGRAPHY

PLATE TECTONIC CYCLE

CONTENT

* GEOLOGY AND NATURAL RESOURCES
* FORCE AND MOTION
* ELECTRICITY AND MAGNETISM

THEMES

* EVOLUTION
* PATTERNS OF CHANGE
* SCALE AND STRUCTURE
* STABILITY

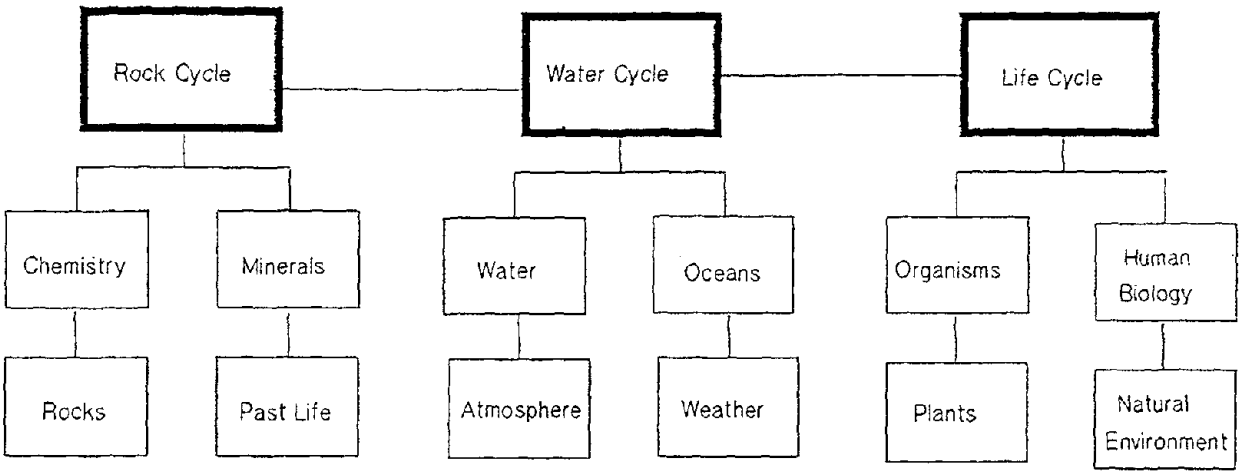
PROCESS SKILLS

* INFERRING
* COMPARING
* RELATING

ADDED FEATURES

* EARTHQUAKE ENGINEERING
* SAFETY AND HEALTH

(NOTE: 1. Science MaTE program contains 100% of the suggested content and process skills recommended by the state + more indepth content information so students can compete in TODAYS and TOMORROWS world.)



CORRELATION TO CALIFORNIA'S STATE SCIENCE FRAMEWORK, 1990

ROCK CYCLE

CONTENT

* GEOLOGY AND NATURAL RESOURCES
* EVOLUTION
* LIVING THINGS
* REACTIONS AND INTERACTIONS
* SOURCES AND TRANSFORMATIONS

THEMES

* ENERGY
* EVOLUTION
* PATTERNS OF CHANGE
* SCALE AND STRUCTURE
* STABILITY

PROCESS SKILLS

* CATEGORIZING
* OBSERVING
* COMPARING
* ORDERING

ADDED FEATURES

* ECONOMICS

WATER CYCLE

CONTENT

* OCEANOGRAPHY
* METEOROLOGY
* GEOLOGY AND NATURAL RESOURCES
* REACTIONS AND INTERACTIONS

THEMES

* PATTERNS OF CHANGE
* SCALE AND STRUCTURE
* SYSTEMS AND INTERACTIONS
* STABILITY
* ENERGY

PROCESS SKILLS

* INFERRING
* OBSERVING
* COMPARING

ADDED FEATURES

* GEOGRAPHY

LIFE CYCLE

CONTENT

* LIVING THINGS
* CELLS, GENETICS, EVOLUTION
* ECOSYSTEMS
* REACTIONS AND INTERACTIONS
* SOURCES AND TRANSFORMATIONS

THEMES

* EVOLUTION
* PATTERNS OF CHANGE
* SCALE AND STRUCTURE
* STABILITY
* SYSTEMS AND INTERACTIONS

PROCESS SKILLS

* CATEGORIZING
* OBSERVING
* COMPARING
* ORDERING

ADDED FEATURES

* DRUG EDUCATION
* HEALTH
* HUMAN SEXUALITY

Integrating Earthquake Education into the Health Curriculum

By Mike De Roche
Curriculum Assistance Mentor, Health
Lakeside Middle School, Irvine, California

Fifty-two percent of third trimester students are home alone from 1 to 5 hours after school. Therefore, it is important for students to have some information about emergency preparedness. Emergency preparedness can be integrated successfully into the seventh grade health course (see Attachment #1).

In an Emergency Preparedness Unit, students are presented with a five day program which includes a cooperative learning activity, home assignments and a writing assignment. As part of the cooperative learning activity, an earthquake preparedness book is used which covers the following topics: earthquake overview, during and after an earthquake, by myself or family discussion, first aid, fire, supplies (Earthquake Kit), and shut offs. Home assignments include the student developing his own plan as well as a map of where supplies are, electricity shut-offs, etc. in his own home. This activity is used to encourage family discussion. Finally, at the end of the week, students are instructed to write an expository essay speculating what they would do during a major earthquake that was centered close to Irvine if they were home alone (see Attachment #2).

Attachment #1

Course Description

This trimester in health, you will be learning about your role in maintaining good health. You will learn to achieve good health by choosing healthful actions that are safe and legal, while respecting yourself and others. Into this trimester, you are bringing your lifetime of experience based on the guidelines set forth by your parents and incorporating these with what you learn in this course.

Course Organization

This course is divided into six instructional units. Each unit will consist of reading assignments, activities, discussions and tests. In addition, you will be asked to keep a personal health journal.

Instructional Units

The health curriculum will include the following units of study:

1. Emergency Preparedness
2. STAR Life Skills
3. Body Systems
4. Human Sexuality
5. Sexually Transmitted Diseases
6. Substance Abuse
7. Nutrition and Diet

Course Journal

You are responsible for making entries in a personal health journal. This journal will include topics related to the instructional units of this class in addition to any personal observations you may make.

SPECULATION ABOUT EFFECT

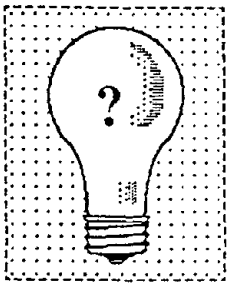
What if....we had a major earthquake here in Irvine and you were the only one home?

WRITING SITUATION

Suppose you were home alone when the BIG ONE hit! What would you do in the event of a major earthquake? Do some kind of prewriting to organize your thoughts about what you would do as soon as you felt the earth begin to shake and after the shaking stopped to assess the damage.

DIRECTIONS FOR WRITING

Write an expository essay speculating what you would do during a major earthquake that was centered close to Irvine.



PTA Leaders

Parents and the Parent-Teacher Association can play an important role in earthquake preparedness plans. They can support the efforts of the school, as well as help carry the preparedness message to the community. In addition, the Parent Teacher Association may include many professionals in a variety of fields that might prove to be a resource to the planning team. Some of the issues that PTA leaders can address are:

- o Parents and Pre-planning
- o Understanding the Roles of School Staff in Disaster
- o Student Release Policy
- o Parental Assistance to the School
- o Home Preparedness and Planning
- o Caring for Children's Psychological Needs
- o Raising Funds for Earthquake Supplies

Student Teams Utilized in a Disaster Situation

By Fran Antenore
Earthquake Preparedness Coordinator
Irvine High School

MAY 1 - MAYDAY!

We want students to know:

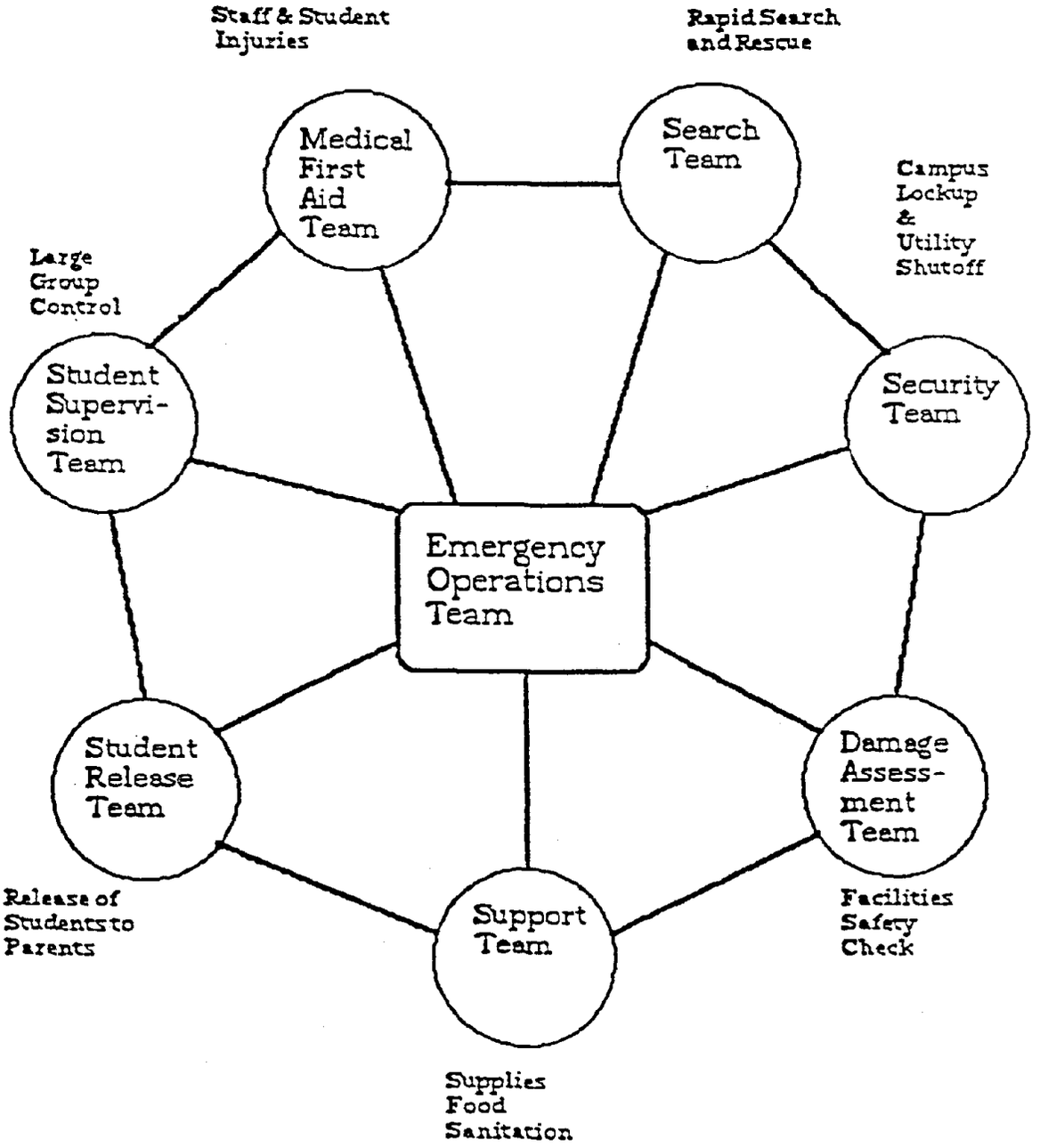
1. What to expect if the "big one" hits:

   - o What it will sound and feel like; to expect aftershocks.
   - o To "drop, cover, and hold."
   - o To wait in the room for 30-90 seconds for things to settle.
   - o To evacuate to your designated area on the field.
   - o If it hits between classes, proceed to the area for their next class; if it hits during snack or lunch, report to the evacuation site of their third period class.
   - o We are on our own for 2-3 days.
   - o IHS is an evacuation site for the community and the freeway.
   - o That we have a plan, that you and all staff members are on teams, and that we need everyone's assistance to implement the plan.

2. What you need to do today:

   - o Have students choose "buddies."
   - o Designate people to grab the folder; show them what is in it, so that they will know what to do if you are incapacitated.
   - o Talk about teams and tell them that they will be able to sign up during parent conferences. The teams include:
     DAMAGE ASSESSMENT: will be part of the emergency operations team and will serve as recorders and runners. We need the names of ham radio operators.
     SEARCH AND RESCUE: all football players are to sign up for this team; they will serve as runners and stretcher carriers.
     MEDICAL: sign up if you have first aid or EMT training; they will assist the other members of this team in helping the wounded.
     STUDENT RELEASE: all office aides and others will locate students on the field so that they can be released to their parents.
     SUPPORT: will be responsible for food, water, and sanitation needs.
     ELEMENTARY SUPPORT: students will walk with a teacher to local elementary schools to offer support to the younger students; a great thing to do if they have siblings at one of these schools.
     ENTERTAINMENT: this will be organized after a disaster. We ask students to bring cards, games, radios, etc., in their cars to be retrieved as we settle in for "the long haul."
   - o Mention emergency release cards, which will be passed out tomorrow in advisement and collected during parent conferences. Students will be released to an adult designated on their card or they can release themselves if the appropriate line has been checked and initialed by a parent.
     *Stress that we don't want them to "split," instead we need them to check out, so that we can monitor who has left campus. Then, if a distraught parent shows up, we will know where the student is.

Irvine High School
Emergency Response Flowchart



IRVINE HIGH SCHOOL
EMERGENCY RELEASE CARD
To be used to release student in the event of a disaster

Name_____Expected graduation year_____
Last, First M.I.
Address_____Phone Number_____
Tract_____
Where parents/guardians may be reached:

Name	Relationship to student	Work Address	Phone

Names of adults to whom student CAN be released in the event of a disaster

_____
_____
_____

Is anyone prohibitted by court order from picking up this student? If yes, please specify. _____

Check here if this student can check himself/herself off campus during a disaster situation.

Name_____
has my permission to serve on the following on campus team:
_____Emergency Operations Team (ASB officers, ham radio operators)
_____Damage Assessment Team
_____Search and Rescue Team (the members of the football team)
_____Medical/First Aid Team(student has some medical/CPR training)
_____Student Release Team
_____Support Team (responsible for food, water, and sanitation)

Has my permission to travel to the following elementary school, accompanied by a teacher, to assist there:
_____College Park
_____Deerfield
_____El Camino Real
_____Greentree
_____Los Naranjos

_____ _____
parent signature date

_____
student signature

What Parents Should Know About Earthquake Preparedness

By Frances E. Winslow, Ph.D.
Emergency Management Coordinator
City of Irvine

Geologists tell us that the San Andreas Fault is ready to experience another major earthquake. The last major quake on the central portion of the fault was in 1857 at Fort Tejon. Since the fault has an earthquake cycle of every 140 years, give or take 20 years, we are now within the time window of earthquake activity. The Newport-Inglewood Fault is a nearby neighbor, only 9 miles from Irvine. It caused the Long Beach earthquake in the 1930's. While its recycling time has not been studied as intensively as that of the San Andreas, it is possible that it could generate a sizable earthquake at any time. Last April 7, it caused a severe jolt to Irvine that is remembered by many.

As parents, you are asked to take an active role in helping to prepare your young people for the experience of a major earthquake. The first thing you should do is make a family earthquake plan. This plan will have to take into account the usual daytime locations of all the family members. You can plan to be reunited at school immediately after the shaking has stopped if you spend your day within walking distance of home. However, if one or both parents rely on freeways or public transportation to get home, it is likely that it could be 12 hours to three days before the family will be reunited. Do you want your young person to go home with a friend or neighbor? Is this person aware that you are expecting her/him to provide your child with food and shelter until you return? Would you prefer to have your child remain at school with friends and teachers for psychological support? Is there an out-of-state contact whom the schools could contact for long-term child care if you are unable to pick up your child within three days? These decisions need to be made now, in consultation with your child.

After you have made your family plan, make sure that your emergency card is up-to-date. Consider whether the people listed on the card could be responsible for your child's physical and mental health and safety during a period of your absence after an earthquake. Be sure that information on the family's out-of-state contact person is included in the emergency record. Make sure that a medical release form for treatment in the event of an earthquake is on file with the school. Following a catastrophic quake, the medical facilities in the area will be stretched beyond capacity. Severely injured people will be taken to county-established casualty collection points for treatment, and perhaps for transportation out of the state. A minor without a treatment release may be deprived of needed medical care.

The City of Irvine has undertaken a campaign to prepare the citizens and the city facilities for the predicted earthquake. Woodbridge High School has been selected as an advanced first aid station and triage center. From this central location, the injured can be transported to available medical resources, whether local or out of the area. A group of licensed medical and counseling professionals has volunteered and received special training to staff this facility. When the Irvine Medical Center is complete, the hospital and the advanced first aid station will be working closely to provide the best medical care for everyone in the most efficient manner. The American Red Cross will be participating in the care of the injured as soon as their volunteers are available.

Irvine High School is a likely location of the projected shelter for earthquake victims. While we do not anticipate building collapses in Irvine, we may experience fires that could leave people homeless. At almost any hour of the day there are commuters, truckers and travelers on the freeways that cross our city. These people would need someplace to stay until the roadways are opened again. In addition, during the business day there are many people working in Irvine who could not reach their homes easily. These people may also require shelter temporarily if their individual companies have not planned to care for their employees. Therefore, the high school shelter may be activated quickly and stay open for several days until transport routes are cleared, repaired and opened.

Communications are generally interrupted, at least temporarily, by earthquakes. If 10% of the telephones are off the hook, for any reason, you cannot get a dial tone when you pick up the phone. We have a volunteer group called "Adopt-A-School" that will provide emergency amateur radio communications for many of our school buildings. It would be good to have additional volunteers, as well. Radio communication will allow school officials to communicate with public safety officials about the condition of the school, possible medical emergencies being experienced, and the condition of the immediate neighborhood. Later, the school will also be a focus for neighbors to send messages to the police, fire and other helping agencies if the phones are not working.

We hope that you and your student will begin to plan for the predicted earthquake, Your school administration has begun the process by creating a school plan and training faculty and staff. With your assistance, your school community can be prepared for the next major movement of California's faults!

Caring for Children's Psychological Needs

By Marion B. Zenoff
Staff Assistant, Special Projects
Irvine Unified School District

Each week has 168 hours. The average adult spends about 100 hours at home. A 40 hour work week plus five lunch hours account for about one-forth of your week. If you sleep eight hours a night, you spend one-third of your time in bed. If these averages describe your life pattern, you can make some reasonable assumptions. When an earthquake strikes, you most likely will be at home (3 chances in 5), in bed (1 chance in 3), or at work (1 chance in 4). These odds reveal that most of your earthquake planning should center on your home, car, and work activities.

The more we are prepared before something happens, the better we will be able to deal with it afterwards. We can control how we plan for this event before it occurs.

An earthquake forces to the surface feelings we don't want to deal with most of the time: the reality of vulnerability, and the painful loss of our cherished illusions about the world. When the earth under our feet is no longer perceived as stable, there is a disrupted view of the world as predictable, and controllable. The after-shocks may serve as a reminder that our basic security continues to be threatened.

People who cope better when faced with an environmental disaster have these attributes: 1. They are emotionally and physically prepared (this gives them a better sense of control); 2. They have self directed problem solving personalities; 3. They have health producing habits (watch diets, relax, exercise); 4. They tend to be committed to social networks; 5. They have positive attitudes; and 6. They know how to grieve/they are not afraid to grieve.

Psychological preparedness is not any less important than physical preparedness. Children react to environmental threat with feelings of helplessness. Children who are dependent upon adults for their basic needs fear the loss of parents and being left alone. When confronted with a disaster, even the child who is usually capable and unafraid may react with fear and anxiety to an event which threatens the family. Children may be concerned with their parents' safety, particularly if they are separated from their parents at the time of the disaster or if one of the parents suffers cuts, bruises, or other injuries.

Once assured that nothing serious has happened, it is time to deal with emotional effects. Each person has his own experience of the event. Even the physical sensations are different for each person. Because of this variety of differences, each person has his own unique emotional reaction. A first step for parents is to understand the kinds of fear and anxiety a child experiences.

Emotional Disorders Exhibited by Children in the 5-12 Age Range May Include:

- Regressive Behaviors-Competition with younger siblings for parents' attention, excessive clinging, crying, engaging in habits they have previously given up (i.e. thumb sucking, bed wetting, pants wetting, wanting to be held, intense attachment to a stuffed animal, blanket or toy).
- School Difficulties - Traumatic events can have a profound effect on a child's progress in school. Anxiety, distractibility and a lack of concentration are reactions which can lead to a drop in the level of school achievement.
- Physiological Reactions - symptoms of illness such as headaches, nausea, vomiting, not wanting to eat, running a fever. Ticks, sleep disturbance nightmares (being afraid to be left alone or afraid to sleep alone), not eating well, complaints of visual or hearing problems, persistent itching and scratching.

- Emotional/Behavioral Reactions - school phobia, withdrawal from play group and friends, becoming quiet and withdrawn (not wanting to talk about the experience), hyperactivity and restlessness, withdrawal from family contacts, irritability, disobedience, repetitive talking, sadness over losses, becoming upset easily, crying and whining, becoming afraid of loud noises, and becoming angry.

Robert S. Pynoss, M.D., M.P.H., in the article "Post-Traumatic Stress in Children and Adolescents" (*The California Psychologist*, January, 1990) states,

> "Contrary to common belief, open discussion with exposed children offers immediate relief, not further distress. This knowledge has provided the basis for the development of intervention strategies to assist the individual child and to enable family members, school personnel and the judiciary to participate in the child's recovery." He further states, "The classroom is an excellent site to screen for children at risk for serious past-traumatic reactions, for addressing fears of recurrence, to provide ongoing cognitive clarifications, for normalizing the spectrum of response among schoolmates, and for discussing general issues of death and dying. Classroom interventions can foster children's seeking support from parents and teachers. However, school based interventions need to be psychologically sound. For example, drawing or redramatization of the destructive force of an earthquake should be followed by similar play activities focusing on rebuilding or reconstruction."

Children react to responses of adults around them. If adults keep calm, there is not much reaction from children. If adults panic and worry about future earthquakes, children will pick up their fears.

Educators and Parents Can Help Children Cope with Their Feelings By:

1. Talking with children, and providing simple and accurate information to questions. Explain about the disaster, the known facts, and listen to what the child has to say. Reduce fears by sharing common experiences.
2. Talking with children about your own feelings. Being told it is normal and natural to be afraid is reassuring. Encourage verbal expression of thoughts and feelings about the disaster. "Wow that shaking was scary. I bet I'll feel funny for awhile." This puts fear in perspective. Children hear that it is okay to be frightened and that fear passes. Children then do not feel alone or that they are weird or cowardly. Their feelings should be listened to respectfully. They want and deserve some sympathy for their fears. It is comforting to hear, "Fears are natural, everybody is afraid at times."
3. Listening to what children say and how they say it. Repeating children's words, recognizing fear, anxiety, insecurity. Help each child clarify feelings. Listen when they tell about how they feel, what they think of, and what has happened. If parents deny danger or fear, this can be especially frightening. Children feel fear and see cues of fear in adults, who pretend not to feel fear. Children tend to imagine that something is so scary or horrible that adults can't even face it. Then, children may develop a specific fear of that situation or become generally fearful.
4. Reassuring children. Children need reassurance by words as well as actions, i.e: "We are all together and nothing has happened to us."
5. Temporarily lessening requirements for optimum performance in school and home activities.
6. Providing opportunity for structured but not demanding chores and responsibilities at home.
7. Responding to repeated questions. You may need to repeat information and reassurances many times.
8. Providing comfort, such as touching or holding your child.
9. Spending extra time putting your child to bed. Talk and offer reassurance, a night light, and leave the door open. The hour before bedtime should be a quiet one, avoiding TV, exciting stories, and rough-housing. A warm bath before bed can also help.

10. Reducing young children's exposure to conversations of adults if you feel the discussions are not appropriate for your children. Attempt to supervise and censor TV news or other programs which you feel might be disturbing to young children.
11. Not discussing or overremphasizing fears continuously. Acknowledgment of fears and a reasonably brave approach are good examples for children. It is necessary to avoid frequently emphasizing negative "what if" situations.
12. Reassuring children that they are cared for and safe. Do this frequently, especially when you notice that they are upset. Help them learn what each student or family member can do to keep themselves safe before, during, and after an environmental disaster. This will help give children a positive sense of control.
13. Not ridiculing or criticizing a child for expressing fears.
14. Helping children learn that earthquakes (floods, tornadoes, etc.) are a normal part of nature. Help them understand what causes these environmental disasters. This knowledge will help children overcome their fears of unknown factors and misleading beliefs. If you show an interest in storms, earthquakes etc. your child learns to be interested, not terrified.
15. Helping children learn that there are many things in life we cannot forsee or control, such as the rain, wind, accidents and illness. However, we can often control how we will deal with these types of events when they do occur. Help them to understand that it is often not the event, but the way we respond to the event, that makes the difference.
16. Using religious and cultural resources to help your family. These resources may be especially helpful when families feel a lack of control.
17. Trying to reestablish a routine for children. This will help them feel more secure. The aim should be to resume normal, routine functioning as soon as possible.
18. Modeling calmness, adequacy, and optimism. Children often react to the responses of adults around them. If adults keep calm, there will be much less reaction from the children.
19. Providing opportunities through children's play to discuss or act out their fears. Experts have studied children's play for decades, and have frequently solved their problems by using toys, art and other objects. Play can set the stage so the child can go directly to the core of the problem. Play can be effective in helping children master their fears involved in traumatic incidents such as environmental disasters. Children can work through with play repeatedly until they feel more in control of memories of the experience. When children are traumatized, their play differs notably. It is often grim, monotonous and repetitive. As a result of environmental disaster children often reach a stage where they are not traumatized but feel helpless. Children are able to express in play what they are too young, too frightened or too pained to express in words. Play has been considered a mirror of a child's internal psychological development and an essential part of healthy growth. It is universal and parents can not only watch their children at play but join in. Young children and parents can play earthquake, hurricane etc. (i.e. knock over blocks, run or say everybody go under the table. Use dolls and furniture in doll house, shake them and make them fall out.) Next, the child will do the same scenario and take another step. They might rebuild the houses they knocked over, or take a doll to the hospital and put a bandage on it. Play represents progress from panic of the event to dramatization that includes healing and restoration. In the first experience they had no control, but in the second they gain control and can make the situation turn out all right.
20. Remembering that a wide range of normal reactions due to environmental disasters usually can be dealt with by support at home and at school.

Professional intervention may be necessary at times. The more misbehaviors the child exhibits, the less age-appropriate the behavior, the longer the duration of the problem, and the more resistant the child has been to efforts to help him, the more likely it is that professional assistance is required to resolve the problem.

Part V

Coming Together as a Team: Organizing Your Plan

5-1 Planning Guidance: A Starting Point for Schools
5-2 Emergency Preparedness Planning for Schools: A Guidebook for Plan Development

Planning Guidance: A Starting Point for Schools

By Frances E. Winslow, Ph.D.
Emergency Management Coordinator
City of Irvine

Emergency plans can be as small as one page, or can include a library of operational plans and legal documents. The best plans are usually those that are simple, and that can be accessed easily by operational personnel during an emergency. An emergency plan is not a book that sits on a shelf, but a set of thoughts, ideas, and guidance developed in a time of peaceful reflection that can be followed in a time of extreme stress.

The planning guidance for schools was developed using a format suggested by the State of California Office of Emergency Services for public agencies. While schools are free to develop their plans in any format, following the state's public agency format has several advantages.

First, using the same plan format will lend itself to using the same terminology during a disaster. Cities will be talking about responsibility found "in Annex B in the earthquake checklist," for example. A school official with the same plan format will understand exactly what aspect of the plan the city representative is activating or referencing.

Second, the state format lends itself to responding to any number of potential emergencies through the flexibility of checklist development. The basic aspects of emergency response do not change whether there is an earthquake, a terrorist incident, or an evacuation required by a hazardous materials incident. People must be notified, moved, and provided with safe shelter. Resources must be available to deal with the incident. Logistics, from food to shovels to high voltage lights, must be coordinated. The basic planning effort will accomplish these goals. Checklists are developed for each type of potential threat. These can address the special needs of that particular type of emergency. These can also designate in advance the agency, department or individual that will assume leadership for that aspect of the response. During the planning stage, the checklists act as prompts for evaluating the level of training, the contents of the resource list, and the supply cache.

Finally, an emergency plan must be drilled, or it has no value. If the schools and the city use the same planning format, they may participate easily in each other's drills. When the city has a drill, the schools may use it as a table top exercise, or participate fully. In either case, each group will be working on the same problem from the same approach, and will be able to evaluate the effectiveness of the interaction.

This planning guidance format may not work for every jurisdiction. Begin your school plan by coordinating with your city to see what plan format they are using. Talk with the city emergency management coordinator about developing a multi-hazard functional planning approach for the city as the schools develop their multi-hazard functional plan. Working together leads to success in all community efforts. Emergency planning is no exception.

Emergency Preparedness Planning for Schools: A Guidebook for Plan Development[7]

By Frances E. Winslow, Ph.D.
Emergency Management Coordinator
City of Irvine

and Carolyn Wells
Orange County Fire Department
Emergency Management Division

How to Develop a Plan that Addresses All Hazards

On April 17, 1989, the Orange County Department of Education and the County's Emergency Management Division conducted a joint meeting of school district and local emergency preparedness coordinators. A new emergency planning guide for schools was introduced to those attending the meeting. Each attendee was given two copies of the planning guide (one for the Superintendent, and one for the Emergency Coordinator of the district). Later that week, two copies of the guide were mailed to each school district not represented at the meeting on the 17th.

The format of the planning guide provides for a great degree of consistency among the planning efforts of schools, school districts, and local governments within Orange County, and promotes coordination with other governmental agencies and private service organizations. The intent of the guide is to assist educators in the development of a comprehensive emergency plan for their respective school districts, and each school site within. The guide was designed to be used as a FLEXIBLE PLANNING AID and allows for individual needs and preferences.

How To Begin

STEP 1: Designate an Emergency Coordinator.

STEP 2: Form an Emergency Organization.

STEP 3: Develop a format which is compatible with the planning guidance issued to local governments by the Governor's Office of Emergency Services (Multihazard Functional Planning Guidance).

STEP 4: Develop a functional matrix, depicting various teams/personnel assigned various functional responsibilities.

STEP 5: Perform a hazard assessment, identifying potentially hazardous situations which could impact the school(s).

The remaining steps in the plan's development should be coordinated by the Emergency Coordinator, based upon results of these first five steps, i.e. one-on-one coordination and follow-up, as needed; regularly-scheduled one-on-one coordination and follow-up; or, regularly-scheduled coordination and follow-up with the entire emergency organization.

Coordinated planning with local government, business and industry, private service organizations, and members of your local community should assure the development of a complete and viable emergency plan for the protection of lives and property within your school district.

[7]The version of the guidebook presented here has been abbreviated to accommodate the format of this publication.

EMERGENCY TELEPHONE NUMBERS

SCHOOL DISTRICT OFFICE Number: _____

LOCAL FIRE DEPARTMENT Number: _____

LOCAL POLICE DEPARTMENT Number: _____

SHERIFF/CORONER'S OFFICE Number: _____

AMBULANCE SERVICES

Name: _____ Number: _____
Name: _____ Number: _____
Name: _____ Number: _____

LOCAL HOSPITALS

Name: _____ Number: _____
Name: _____ Number: _____
Name: _____ Number: _____

LOCAL EMERGENCY SERVICES OFFICE Number: _____

SUPERINTENDENT Office: _____ Home: _____

PRINCIPAL Office: _____ Home: _____

SCHOOL EMERGENCY SERVICES COORD. Office: _____ Home: _____

SCHOOL NURSE Office: _____ Home: _____

QUALIFIED FIRST AID PERSONNEL

Name: _____ Location: _____
Name: _____ Location: _____
Name: _____ Location: _____
Name: _____ Location: _____
Name: _____ Location: _____

UTILITIES

Name: _____ Location: _____
Name: _____ Location: _____
Name: _____ Location: _____

RADIO AND TV STATIONS

Name: _____ Location: _____
Name: _____ Location: _____
Name: _____ Location: _____
Name: _____ Location: _____

(Radio and TV stations may be requested to make announcements when students are to be sent home.)

ANNEX/FUNCTION

Campus Teams/Personnel	A									B	C		D	E	F	G	H	I	J	K			
	Management	Recovery	Communications	Alert & Warning	Situation Analysis/Damage Assessment	Public Information	Radiological Protection	Finance	Vital Records Protection	Fire & Rescue	Law Enforcement	Traffic Control	Medical	Public Health	Coroner	Care/Shelter	Movement	Rescue	Construction/Engineering & Utilities	Supply/Procurement	Personnel	Transportation

"P" denotes primary responsibility

"S" denotes support role

Making Your Plan: Hazard Evaluation

Hazard Assessment

An analysis should be conducted to identify potentially hazardous situations which would impact the schools. Each potential hazard may be divided into three (3) risk factors: Low, Moderate, and High. These risk factors will indicate whether there is a risk of occurrence and the potential of the risk. The following list identifies a number of potential hazards which may be considered in conducting such an assessment:

Potential Hazards/Vulnerability

HAZARD	RISK FACTOR
Air Pollution	
Aircraft Accidents	
Avalanche	
Dam/Levee Failure	
Earthquake	
Energy Shortage	
Fire - Structural/Urban/Wildland	
Flooding	
Hazardous Materials Release	
Landslide	
Liquefaction	
Nuclear Attack	
Nuclear Power Plant Accident	
Pest Infestation	
Rail Accidents	
Ship-Ferry Accidents	
Terrorism	
Tsunami	
Volcanic Eruption	
Water Pollution	
Windstorm	

Identification of Potential Disasters

The following are examples of elements to be considered in the development of the identification of potential disasters, based upon information contained in the section entitled **Hazard Assessment.**

1. Site-level
   - o Location and Population Characteristics (urban, rural, industrial, residential, etc.)
   - o Access/Egress Routes and Parking (considerations for evacuation, response vehicles, etc.)
   - o Special Considerations (unique problems, circumstances, etc.)
2. Potential Disaster (example: Earthquake)
   - o Situation
   - o Planned Response

Earthquake

Describe method by which students and school personnel will be notified of an earthquake.

Inside School Building

Students and staff immediately take protective position* under desks or furniture, with backs to windows (*protective position means drop to knees; clasp both hands behind the neck; bury face in the arms; make body as small as possible; close eyes; and cover ears with forearms).

1. Try to avoid glass and falling objects. Move away from windows where there are large panes of glass and out from under heavy suspended light fixtures.
2. When earthquake is over, move students and staff from inside school building to an outside area of safety. Special consideration should be given to exit routes, as many schools have heavy architectural ornaments over the main entrances. DO NOT RUN.
   - o Do not return to buildings for any reason until they have been declared safe.
   - o Guards should be posted at a safe distance from all building entrances to see that no one re-enters the buildings.
3. Do not light any fires after the earthquake.
4. Avoid touching electrical wires which may have fallen.
5. Render first aid, if necessary.
6. Request assistance, as needed, through channels from the local emergency services office.
7. Notify utility companies of any break or suspected leak.
8. If possible, notify the emergency preparedness coordinator or other appropriate school official.
9. The principal will determine the advisability of closing the school. If necessary, he will try to procure the advice of appropriate authorities about the safety of the building.

On School Grounds

1. The teacher, or other person in authority, implements protective action.
2. The safest place is in the open.
3. Move away from buildings, trees and exposed wires.
4. DO NOT RUN.
5. Follow procedures 8-9 under **Inside School Building.**

On School Bus

1. If possible, the bus driver will pull to side of road, away from any buildings and overpasses, and implement protective action.
   - o On a mountain road, the side of the road may not be the safest place, hence the bus driver should quickly consider the terrain before deciding where to stop.
2. Set brakes.
3. Turn off ignition.
4. Wait until earthquake is over.
5. Follow procedures 3-8 under **Inside School Building.**
6. Contact the appropriate school official for instructions.

Walking to and from School

1. The safest place is in the open. Stay there.
2. Move away from buildings, trees and exposed wires.
3. DO NOT RUN.
4. After the earthquake, if on way to school, continue to school.*
5. After the earthquake, if on way from school, continue home.*

Teachers should instruct students to react in the same manner when on their own in case it occurs while they are on their way to or from school, away from school, or the teacher is temporarily not present.

*Policy to be determined.

Flood - Tidal Wave

Describe the method by which warning of a flood or tidal wave is received by your school.

Describe the method by which warnings of a flood or tidal wave is disseminated to students and school personnel.

The extent of the flood or tidal wave, and the amount of time before it arrives, will dictate the course of action to be taken. The principal may initiate the following emergency actions, as appropriate:

1. Dismiss all classes.
2. Return students to their homes by the most expeditious means.
3. Move students and staff in an orderly manner from inside school building to an outside area of safety.
4. Load students and staff into school buses, cars, and other means of transportation, and take them from an area of danger to an area of safety.
5. Provide care for students at school.
6. Dismiss all classes and prepare the school for conversion into an emergency hospital, first aid station, or congregate care center. (Conversion of school into one of these facilities would be initiated only upon request of local emergency preparedness officials or the American Red Cross.)

Hazardous Materials

Describe method by which students and school personnel will be notified of a hazardous materials incident.

Hazardous materials incidents of disaster magnitude will include tank truck accidents involving large quantities of toxic gases. Should such an incident endanger the students or staff, the principal may initiate emergency actions which will allow for the following, as appropriate:

1. Orderly movement of students and staff from inside school building to an outside area of safety; or
2. Orderly movement of students and staff from outside school building to an inside area of safety.
3. Move crosswind - never up or downwind - to avoid fumes.
4. Maintain control of the students at a safe distance.
5. Render first aid, as necessary.
6. Notify the Fire Department.
7. Notify the Police/Sheriff's Office.
8. Take roll call.
9. Notify the school district's emergency preparedness coordinator or other appropriate school official.
10. Students and staff should not return to the school until Fire Department officials declare the area safe.

Fire

Describe method by which students and school personnel will be notified of a fire.

Fire Within School Building

The principal may initiate emergency actions which will allow for the following, as appropriate:

1. Sound the school fire alarm.
2. Orderly movement of students and staff from inside school building to an outside area of safety.
3. Move to an area of safety, and maintain control of students.
4. Render first aid as necessary.
5. Notify the Fire Department.
6. Notify the Police Department/Sheriff's Office.
7. Fight incipient fires without endangering life.
8. Keep access roads open for emergency vehicles.
9. Take roll call.
10. Notify the school district's emergency preparedness coordinator or other appropriate school official.
11. Notify utility companies of a break or suspected break.
12. Dismissal of all classes.
13. Return of students to their homes by the most expeditious means.
14. Students and staff will not return to the school until fire department officials declare the area safe.

Fire Near School

The principal may initiate emergency actions which allow for the following, as appropriate:

1. Orderly movement of students and staff from inside school building to an outside area of safety.
2. Determine whether students and staff should leave the school grounds.
3. Move to an area of safety and maintain control of students.
4. Take roll call.
5. Notify the school district's emergency preparedness coordinator or other appropriate school official.
6. Load students and staff into school buses, cars and other means of transportation, taking them from an area of danger to an area of safety.
7. Students and staff will not return to the school until fire department officials declare the area safe.

Bomb Threat

Describe method by which students and school personnel will be notified of a bomb threat.

The vast majority of bomb threat telephone calls and notes are hoax or prank calls; however, all such threats must be handled quickly and efficiently.

Responsibility for determining the exact course of action in each case should remain with the Principal of the school.

The Principal may initiate emergency actions which will allow for the following, as appropriate:

Location of Bomb Unknown*

1. The person receiving a call or note advising of a bomb will immediately notify the Principal or next highest authority available at the school
2. Immediately notify: school district office, local police department/sheriff's office and local fire department.
3. Faculty members, custodian personnel, and available district personnel not involved in classroom activity conduct a search of the school premises for any bomb. Plain-clothes police or fire personnel will assist, if requested.
4. Send notice, in writing, to teachers alerting them of the situation.
5. If anything of a suspicious nature is found in the search, proceed as for "Location of Bomb Known" (below).
6. If nothing is detected, normal activities should resume; and
7. A complete written report should be submitted to the district office, giving as much detail as possible as to characteristics of person making threat, content of message, and the time and date.

*Consideration may be given to immediate evacuation.

Location of Bomb Known

1. Upon determining location of a bomb or potentially explosive material or device, the area surrounding the location should be immediately cleared of all students and other personnel.
2. Immediately notify school district office, local police department/sheriff's office, and local fire department. All action regarding disposal or handling of bomb or device will be handled by law enforcement personnel.
3. Upon removal of bomb, normal activities should resume.
4. Consideration should be given to necessity of psychological debriefings/crisis counseling for those affected.

Fallen Aircraft

Describe method by which students and school personnel will be notified of an aircraft which has fallen near the school.

The principal may initiate emergency actions which will allow for the following, as appropriate:

1. Keep all students and staff at a safe distance, in case of explosion.
2. Determine whether the aircraft is military, commercial or private, if possible.
3. Notify the Fire Department.
4. Notify the Police Department/Sheriff's Office.
5. Notify the school district's emergency preparedness coordinator.

Explosion or Threat of Explosion

Describe method by which students and school personnel will be notified of an explosion or threat of explosion, such as those caused by leaking gas or a faulty boiler within a school building.

Explosion

The principal may initiate emergency actions which will allow for the following, as appropriate:

1. Students and staff immediately take protective position* under desks or furniture, with backs to windows (*protective position means drop to knees; clasp both hands behind the neck; bury face in the arms; make body as small as possible; close eyes; and cover ears with forearms).
2. Sound the school fire alarm.
3. Orderly movement of students and staff from inside school building to an outside area of safety.
4. Render first aid as necessary.
5. Notify the fire department.
6. Notify the police department/sheriff's office.
7. Fight incipient fires without endangering life.
8. Take roll call.
9. Notify the school district's emergency preparedness coordinator or other appropriate school official.
10. Notify utility companies of a break or suspected break.
11. Students and staff will not return to the school until fire department officials declare the area safe.

Threat of Explosion

The principal may initiate emergency actions which will allow for the following, as appropriate:

1. Sound the school fire alarm.
2. Orderly movement of students and staff from inside school building to an outside area of safety.
3. Move to an area of safety and maintain control of students.
4. Render first aid as necessary.
5. Notify the fire department.
6. Notify the police department/sheriff's office.
7. Take roll call.
8. Students and staff will not return to the school until fire department officials declare the area safe.

Severe Windstorm

Describe method by which students and school personnel will be notified of a severe windstorm.

If time and conditions permit, the principal may initiate emergency actions which will allow for the following as appropriate:

1. Dismissal of all classes.
2. Return of students to their homes by the most expeditious means.

If high winds develop during school hours with little or no warning, the principal may initiate emergency actions which will allow for the following, as appropriate:

1. Assemble students and staff inside shelters or buildings.
2. Take precautions to minimize the possibility of flying objects such as shattered glass or venetian blinds.
3. Close windows and blinds.
4. Students and staff remain near an inside wall, on the lower floors, if possible.
5. Avoid auditoriums, gymnasiums, and other structures with large roof spans.
6. Evacuate classrooms bearing full force of wind.
7. Keep tuned to a local radio station for latest advisory information.
8. Take roll call.
9. Notify utility companies of any break or suspected break.
10. If possible, contact the school district's emergency preparedness coordinator or other appropriate school official.

State of Emergency
(California State Definition)

The duly proclaimed existence of conditions of disaster or of extreme peril to the safety of persons and property within the state caused by such conditions as air pollution, fire, flood, storm, epidemic, riot, drought, sudden and severe energy shortage, plant or animal infestation or disease, the Governor's warning of an earthquake or volcanic prediction, or earthquake or other conditions, other than conditions resulting from a labor controversy, or conditions causing a "state of war emergency," which conditions, by reason of their magnitude, are or are likely to be beyond the control of the services, personnel, equipment and facilities of any single county, city and county, or city and require the combined forces of a mutual aid region or regions to combat, or with respect to regulated energy utilities, a sudden and severe energy shortage requires extraordinary measures beyond the authority vested in the California Public Utilities Commission.

State of War Emergency
(California State Definition)

The condition which exists immediately, with or without a proclamation thereof by the Governor, whenever the state or nation is directly attacked by an enemy of the United States, or upon the receipt by the state of a warning from the federal government that such an enemy attack is probable or imminent.

Making Your Plan: Checklists for Key Personnel

Checklist for Superintendent

1. Be knowledgeable of responsibilities for emergency preparedness, including elements of your plan.
2. Appoint an assistant and alternate.
3. Order a site and building hazard survey by a qualified structural and civil engineer.
4. Order removal or correction of hazards, as feasible.
5. Appoint a chairperson for an Emergency Preparedness Committee (to serve more than one year to allow for continuity).
6. Cooperate with chairperson of Emergency Preparedness Committee (to see that terms of the Plan are carried out).
7. Keep parents informed of school policies and plans relating to emergency preparedness.
8. Require all teachers to periodically review emergency plans and procedures.
9. Require all teachers to periodically check preparations for their own classrooms.
10. Recommend that all teachers hold current first aid certification. Recommend that a number of teachers at each school hold current CPR certification.
11. Require business manager to check emergency plans of bus drivers.
12. Require all schools to carry out drills and emergency preparedness education programs for students and teachers.
13. Develop procedures for protection of vital records.
14. Develop a procedure for releasing staff members.
15. Encourage all teachers to prepare family emergency plans.
16. Near the end of the school year, require the Emergency Preparedness Committee to prepare a list of supplies needed for the following school year.
17. Present annual reports to the school board concerning emergency preparedness, including procedures, expenses and recommendations for the following school year.
18. Develop, and regularly test, home preparedness plan.

Checklist for Principal

1. Be knowledgeable of responsibilities for emergency preparedness, including elements of your plan.
2. Appoint an assistant and alternate.
3. Designate location(s) for emergency first aid station(s).
4. Designate persons to operate emergency first aid station(s).
5. Supervise decentralized storage of supplies, equipment and water.
6. Establish procedures for protection of vital records.
7. Supervise training of teachers in their responsibilities for emergency preparedness, first aid, CPR, the buddy system, etc.
8. Assist teachers in developing methods to include substitutes and aides in the plan.
9. Assist teachers in designating alternate evacuation routes from each classroom to assembly point.
10. Develop traffic control plan for implementation during an emergency or disaster.
11. Designate person responsible for traffic control, as well as an assistant.
12. See that drills are completed as scheduled.
13. Develop emergency procedures for night custodians/security personnel.
14. Provide emergency preparedness resource materials to all schools.
15. Develop, and regularly test, home preparedness plan.
16. Determine if school has been designated as a community shelter. (Cross-references: page 209 - **Recovery**; page 216 - **Annex G-Care and Shelter**; and page 217 - **Annex H - Movement**)

Checklist for Teachers

1. Be knowledgeable of responsibilities for emergency preparedness, including segments of your plan.
2. Take current first aid training as provided.
3. Conduct drills as required.
4. Include emergency preparedness education in the curriculum when appropriate.
5. Develop, and regularly test, home preparedness plan.

Checklist for Nurses

1. Be knowledgeable of responsibilities for emergency preparedness, including elements of your plan.
2. Organize and maintain first aid supplies.
3. Work with the Emergency Preparedness Committee when appropriate.
4. Prepare for special medical needs of students and staff.
5. Develop, and regularly test, home preparedness plan.

Checklist for Secretarial Staff

1. Be knowledgeable of responsibilities for emergency preparedness, including elements of your plan.
2. See that battery operated AM-FM radio is available and in working condition.
3. Know call number and frequency of Emergency Broadcast Stations for your area.
4. Develop, and regularly test, home preparedness plan.

Checklist for Custodians

1. Be knowledgeable of responsibilities for emergency preparedness, including elements of your plan.
2. Know location of cut-off valves for water, gas and electricity, and intake valves on water heaters.
3. Know procedures for turning off water, gas and electricity.
4. Know procedures for establishing emergency sanitary facilities.
5. Know firefighting procedures.
6. Know location of emergency equipment and supplies.
7. Develop, and regularly test, home preparedness plan.

Checklist for Bus Drivers

1. Be knowledgeable of responsibilities for emergency preparedness, including elements of your plan.
2. Be knowledgeable of administrative policies regarding emergency procedures.
3. Keep current on state and county emergency procedures for bus drivers.
4. Develop, and regularly test, home preparedness plan.

Making Your Plan: Functional Annexes

Annex A - Managing Emergency Operations

The following are examples of elements to be considered in the development of this annex:

1. Establish an emergency organization scheme.
2. Designate leaders for each annex.
3. Review all functions and develop operational guidelines.
4. Complete all annexes.

Warning

Describe the type(s) of warning system(s) utilized by your school.

Describe the method(s) by which warning of existing or impending emergencies/disasters is/are received by your school.

Describe the method(s) by which warning of existing or impending emergencies/disaster is/are disseminated to students and school personnel.

Alternate Warning

Describe the type of warning system(s) to be utilized by your school in the event of failure of the primary warning system.

Communications

Describe the emergency communications system(s) within your school.

Conduct an inventory to identify all existing communications systems, including commercial and amateur radio operators and systems, within the school's population (include parent/teachers' organization, etc.). Determine how all systems can be linked, for emergency purposes, with each other and with other systems within the community. Designate personnel responsible for coordinating communications. It is important to remember that amateur radio operators may be your only communications link to the outside world.

Emergency Shutdown Procedures

A complete checklist for emergency shut-down and disaster control should be developed, including the following procedures:

1. Individuals have the responsibility to complete check-off lists and to supervise shut-down procedures within their respective areas.
2. Individuals on each shift are to be assigned specific responsibilities for shut-down.
3. Red emergency shut-off tags are to be stored with, or near, major pieces of equipment for attachment when shut-down procedures are implemented.

Individuals should be instructed and trained to implement emergency shut-down procedures, including the following:

1. Shut-down procedures for utility services and equipment should be developed and tested.
2. Instructions should be prepared and posted on, or near, control panels, valves, switches, and operating mechanisms of major pieces of equipment.
3. Individuals on each shift should be designated to close doors and windows, tie down loose equipment, and barricade windows and doors.

Situation Analysis/Damage Assessment

Damage assessment and control techniques should be established to minimize property loss, including the following:

1. Equipment and materials should be protected by banding, tie-down, and moving critical or valuable equipment to protected areas.
2. Building zones, or areas, should be established and included in assignments involving physical security of the school.

Compilation of damage assessment data may be comprised of the following steps:

1. Location of damage: Geographical location of damaged facility or site of the emergency work.
2. Degree of damage: Generally applicable to specific structures, buildings, or structures by which the relative impact or severity of the problem can be evaluated. (For example: 30-35% damage.)
3. Description of damages: Narrative description explaining the nature of the disaster-related problem. Detailed design characteristics and complicated calculation are not necessary.
4. Estimates of cost: Cost is estimated for each identifiable disaster-related problem within a particular category of work. A separate estimate should be provided for each facility or system affected.
5. Cost by category: A summary of all costs reported within each particular category of work.
6. Insurance coverage: Structures, buildings, and equipment for which insurance coverage has been purchased should be indicated by showing the deductible amount of the applicable coverage.

All information gathered should be provided to local government.

(Cross-reference: page 217 - **Annex J: Construction/Engineering & Utilities**)

Public Information

Only one person should be designated as the Public Information Officer in order to prevent the release of conflicting reports. Below are actions which should be taken by the Public Information Officer during a disaster; additions or deletions may be made, depending on the situation.

1. Ensure that all information is clear, concise, confirmed, and approved by the appropriate school official before release to the media or public. Do not release unconfirmed information or speculate on the extent of the emergency, despite repeated urging by reporters to do so. Never hesitate to say, "I don't know, but I'll find out."
2. Monitor published and broadcasted information for accuracy. Correct serious misinformation whenever possible.
3. Provide sufficient staffing and telephones to efficiently handle incoming media and public calls, and to gather status information.
4. Ensure that the official spokesperson is thoroughly briefed about all aspects of the emergency situation.
5. Keep the District Office informed of all actions taken or planned.

6. Keep Public Information Officers in local governments apprised of information released.
7. Maintain a public information release log and a documentary file of all information, instructions, and advice released.

Radiological Protection

Students and personnel should be relocated to a shelter or the most protected portion of the building. In radiological protection, three major factors must be considered when selecting a shelter area: distance, mass and time.

1. The more distance between you and radiation, the less radiation you will receive.
2. The more heavy, dense materials between you and radiation, the better. Materials such as concrete, bricks, and earth will absorb much of the radiation and will help keep it from reaching you.
3. Since particulate radiation decays fairly rapidly, as time passes, radioactivity loses its strength.

Continuous effort should be made to increase shelter protection by surrounding students and personnel with radiation-absorbing materials, such as boxes of books, dirt, wood, steel, or pieces of masonry. Also, students and staff should limit time spent in radiation areas, in order to keep exposure to a minimum.

Exposure to radiation does not cause people to become radioactive and pose a threat to others; however, thoroughly brushing off clothing prior to entering the shelter allows for the removal of particles that may continue to emit radiation.

All persons must remain in the shelter area until authorities determine and announce that it is safe to leave. A portable, battery-operated radio should be available in order to receive emergency broadcasts.

Recovery

Recovery activities continue beyond the emergency period immediately following a disaster. The purpose is to return all systems to normal. Short-term activities attempt to return vital human systems to minimal operating standards and usually span an approximate period of two weeks. Long-term recovery activities stabilize all systems and can last for many years after a disaster. (Cross-references: page 205 - **Checklist for Principal**; page 216 - **Annex G - Care and Shelter**; and page 217 - **Annex H - Movement**).

The following are examples of elements to be considered when addressing the recovery function:

1. Assist in damage assessment activities.
2. Coordinate resource management.
3. Phase down operations, as appropriate.
4. Develop a public information program to disseminate recovery operations.
5. See that searchers/rescuers are out of the affected area or have been accounted for.
6. Arrange for early return of persons needed to staff essential service operations.
7. Initiate general return to area as soon as possible.
8. Provide traffic control for return.
9. Return mutual aid and augmentation forces to home jurisdictions as soon as possible.
10. Pay expenses for all outside personnel asked to assist who are not otherwise reimbursed.
11. Account for gear and equipment; repair and resupply, as necessary.
12. Maintain appropriate records.
13. Clean and return equipment to pre-emergency condition, and replenish supplies.
14. Compile expenditure data and cost figures for submission to appropriate authorities for reimbursement.
15. Prepare documents for submission to local, state, and federal governments.

16. Compile a chronological record of events.
17. Compile after-action report and critique.
18. Assess effectiveness of public information program.
19. Conduct critique of operations, and initiate action to improve plans and resources.
20. Monitor restoration activities.

Finance

At the onset of a disaster, the fiscal staff should immediately begin to record and summarize costs of response in such a manner that will provide the basis of determining actual and total response costs for initial efforts, final clean-up, and reconstruction or repair of damaged facilities, structures, etc. Objectives of recording such costs are:

1. Accumulation and reporting of all costs incident to disaster response and recovery.
2. Obtaining maximum state and federal reimbursement of all eligible costs.
3. Assist all responding departments in identifying and justifying budget overruns resulting from response to the disaster.

The following are examples of elements to be considered in the development of financial procedures:

1. Coordination of record-keeping for personnel time, equipment time, purchases, and vendor contracts.
2. Recommendations concerning cost-effective strategies for resource procurement.
3. Coordination with local government in emergency operations.
4. Resource procurement must be planned well in advance in order to effectively respond to and recover from a disaster.

Drills and Exercises

The success of a school's emergency organization and plan can only be measured through regular training and testing.[8]

Properly designed training programs assure that the following objectives are met:

1. Every member of the emergency organization is able to react automatically in an emergency.
2. Every member of the emergency organization knows their responsibility.
3. Every member of the emergency organization has acquired skills to do their job efficiently.

Properly designed exercises ensure actual operation or simulation of each element of the plan. Following the exercises, records should be maintained so that deficiencies can be corrected. Exercises should be as realistic as possible, with as little advance notice and preparation as possible. Routine exercises, at pre-designated times and dates, become ineffective quickly.

It is unfortunate that most emergency planners rush to meet and analyze the deficiencies and failures of the emergency organization and plan after the occurrence of a disaster. The best method for revealing flaws and deficiencies in the emergency organization and plan is exercising all components before a disaster occurs. Pertinent information can be recorded on an "Emergency Action Checklist" and "Special Issues in Emergency Plan Implementation" form.

[8]The Education Code, Part 21, Chapter 2, Article 10.5, sections 35295 through 35297, requires "earthquake emergency procedure systems in kindergarten and grades 1 through 12 in all the public or private schools in California."

Annex B: Search and Rescue

The following are examples of elements to be considered in the development of this annex:

1. Coordination of Search and Rescue Team activities
2. Tracking of Search and Rescue Team
3. Relationship between Search and Rescue Team and Stretcher Team
4. Relationship of Search and Rescue Team and First Aid Team
5. Maintenance of Search and Rescue supply kits:
   hard hat, gloves, goggles, flashlight, clipboard with pen attached by string, map of the school facility and pad of paper for note-taking, totebag containing light sticks, bandaging material for major bleeding, triage tags. You may wish to add a small bar for forcing entry to a room.
6. Communication with Principal regarding status of search
7. Availability of professional damage assessment assistance, or development of basic damage assessment capability
8. Fire safety issues must be considered: Is there smoke in the building? Is there an extinguisher available in less than 30 seconds? Are any of the personnel trained to evaluate the fire and use the extinguisher?

Pertinent information can be recorded on an "Emergency Action Checklist" and "Special Issues in Emergency Plan Implementation" form.

Annex C: Safety and Security Considerations

The following are examples of elements to be considered in the development of this annex:

1. Has the school perimeter been secured?
2. Are children maintained in a close group to prevent wandering off, or unauthorized removal of a child? (If the school yard is not fenced, consider using traffic delineators or stakes and rope to create a "corral" for the children while they are outside. These should be kept with the Search and Rescue Team supplies, and should be placed around the holding area as quickly as possible. Older students can do this job with the supervision of a teacher.)
3. Are Student Release staff trained in all procedures?
4. Do Student Release staff have release forms, passes, student emergency cards, file box for cards of children that have been taken, file box for cards of children still at school, list of missing children, injured children, table and chairs, and other tracking items needed? Has adequate shade been provided?
5. Does every student have an annually updated emergency card with school photo, current work information on parents (street address, suite number, phone and FAX numbers)? Does the card include the name(s) of local people who can take the child? Does the card include a blanket emergency medical authorization made out to "the principal or his designee?" Children with life-threatening conditions can be treated without consent, but children with non-life-threatening injuries (such as broken bones) will be denied treatment without a sign "authorization to treat a minor."
6. Older students can be used as runners to get released children from the holding area.
7. Parents who are willing to stay at school can augment the perimeter watch team.
8. Do you have a plan to contact local law enforcement personnel in a bona fide emergency that you cannot handle (irate parent, someone trying to take a child who is not authorized, fire on school grounds, civil unrest in the area of the school)? You should know how to find an amateur radio operator, bus driver, beat patrol officer, or anyone else who can communicate with the City's Emergency Operation Center for you. You should also have immediate contact with your district office, if possible.
9. How will you handle the parents of missing children?
10. How will you handle the parents of injured children?

Pertinent information can be recorded on an "Emergency Action Checklist" and "Special Issues in Emergency Plan Implementation" form.

Annex C/1: Traffic Management

The following are examples of elements that should be considered in developing this annex:

1. Do parents understand the plan for student dismissal so they can arrive at the proper part of the school property?
2. Have delineators and rope been provided to create a "corral" style waiting line (where the rope separates sections of the line into a "snake")?
3. Have staff been assigned to monitor use of the parking lot (no double parking, illegal parking, blocking the entrance when the lot is full)?
4. Have staff been assigned to monitor the streets adjacent to the school to insure access for emergency vehicles? (This is a role that parents might accept. You might ask your regular crossing guard to return to school as quickly as possible in the event of an emergency. Someone needs to direct traffic at the nearest intersection, to point out available parking, and to discourage people from simply leaving their cars anywhere). This group should be provided with reflective traffic vests, flashlights, whistles and simple traffic control training. Contact your local police department for training assistance.

Annex D: Medical

The following are examples of elements to be considered in the development of this annex:

1. Are all staff trained in first aid and triage?
2. Is the first aid area established where it is shaded, not close to buildings? (Use tarps to create artificial shade if you have no trees. Make sure to stock adequate tarps, cord and stakes for this purpose.)
3. Are all first aid supplies checked and rotated at least annually? Remember that adhesive material deteriorates quickly in the heat of outdoor storage areas.
4. Is adequate water available for washing wounds, forcing oral fluids with dehydrated patients? Do you have a means to boil water for sterilization? (Hint: a camper stove and a butane cylinder is a good resource here.)
5. Do you know how to get advanced treatment for severely injured children? Does your city have a medical emergency plan? Have they established a triage point for severe injuries? Do you know how you will transport the injured to a treatment facility? Do you have a map with the hospitals and walk-in clinics in the first aid kit?
6. Do you have children with special health needs? Diabetics, heart patients, hypertension patients, and others on medication will need special consideration to hydration, stress levels, and administration of medication. Any feeding that you propose must keep the dietary needs of these special populations in mind.
7. Do you have students with limited mobility, physical limitations, special mental or emotional needs? Have trained staff been assigned to this group of children? Have special instructions been received from their physicians for long-term supervision following a disaster? Have their parents taken responsibility to see that back-up equipment such as wheel chairs, respirators, glasses or hearing aids are available?

Pertinent information can be recorded on an "Emergency Action Checklist" and "Special Issues in Emergency Plan Implementation" form.

Annex E: Public Health

The following are examples of elements to be considered in the development of this annex:

1. What provisions have been made to provide fresh drinking water to all students and staff?
2. What provisions are there for water for washing, personal hygiene, and sanitation needs?
3. How will food service be handled: prepackaged foods, disposable paper products?
4. How will paper waste be disposed of? How will food waste be disposed of? Do you have adequate trash bags and ties? Have you designated a location to store the full bags until refuse disposal services are available?
5. What arrangements have been made for sanitation? Do you have heavy weight trash bags for lining toilets? Do you have adequate restroom paper products for the entire school population for three days? Do you have a plan for the safe storage of used waste bags until the sanitary sewer is available again? Because of possible incursion into the ground water, you CANNOT use trench toilets, nor can you bury untreated human waste. Do you have a disinfectant to use inside the trash bags to minimize odors in restrooms with open bags still in use? Has a restroom monitor been assigned to supervise the installation and changing of bags? Have placards been made with the instructions for lining the toilets with the bags, adding disinfectant, terminating the use of a bag, proper closure and storage? Have you obtained lighting for restrooms that lack windows, and for use at night (lanterns or candles)? Has this information been provided to parents and reviewed with students, as well as all staff?
6. Are all student innoculations up to date? All staff?
7. Do you have an adequate supply of waterless hand-wipes for handwashing after using the restroom, after handling trash, before and after handling food?
8. Do you have heavy duty gloves for use in removing bags from toilets? Have you made provisions for moving the used bags to the storage location (dolly, rolling cart, wagon)?
9. Have you identified any special health hazards in your area? Have you coordinated with your school district regarding special public health considerations?
10. Have you contacted your county public health agency to coordinate your efforts with theirs?

Pertinent information can be recorded on an "Emergency Action Checklist" and "Special Issues in Emergency Plan Implementation" form.

Annex F: Coroner

1. Have you designated a morgue site? Remember that the flooring should be washable, and not wooden. The room should be shaded as much of the day as possible. It should be out of the view of students. It should be able to be ventilated readily, ideally with doors and windows on more than one side of the room.
2. Do you have plastic sheeting to use to cover the dead? Sheeting should be placed on the morgue floor first. The deceased can be laid on the sheeting, and individual plastic sheeting pieces can be draped over them. Avoid binding the bodies, as lack of air circulation promotes decomposition.
3. Do you have a reporting format for accounting for the dead (location where body was discovered, probable cause of death, name and identifying information that is known)? Do you have tags that can be attached to the body for identification purposes? (It has been suggested that the county coroner may have to collect bodies for removal to another location, so it is important that identification be firmly attached).
4. Have you made provisions for the safe keeping of any valuables belonging to the deceased?
5. Do you know the legal procedure for releasing a body to a relative? Check with your county coroner for guidance.
6. Do you have a plan for notifying families of their loss? Do you have a plan for dealing with relatives who come to your site for a deceased family member? Has someone on your staff had training in critical incident stress debriefing?
7. Have you established how your local police department wants to be notified of deaths during a disaster (by phone, by runner, by radio)?
8. Have you decided who will move the bodies from the classroom and public areas (stretcher team? A separate morgue team)?

Pertinent information can be recorded on an "Emergency Action Checklist" and "Special Issues in Emergency Plan Implementation" form.

Annex G: Care and Shelter

The following are examples of elements to be considered in the development of this annex:

1. Where will you take the children while the school is being searched? Do you have shelter available if it is raining or very hot? Do you have water available?
2. Where will you set up the first aid area? Do they have shade, shelter from rain or wind, water available for drinking and washing?
3. Who is responsible for getting out the stored food and drinking water supplies?
4. How will you handle feeding? Single distribution point? By classroom? By grade level?
5. How will children sleep at school if parents have not come by night time? Do you have space blankets? Will they sleep on the floor?
6. Do children have spare clothes? What will you do if someone soils their clothes so that they are objectionable to others and unwearable?
7. Have all faculty been informed of their legal obligation to stay at school and continue to provide supervision until all of their class is dismissed?
8. Have faculty prepared their own families for their post-disaster absence? Have they made a family plan? Do you have a plan for family emergency communication (phone number, ham radio, runner system)?
9. Have you established a communication link with your city and the American Red Cross to learn the location of the nearest Red Cross Shelter? If the general public shows up at the school, they should be directed to the nearest American Red Cross Shelter, or to the City information point. Members of the general public should not be allowed to intermingle with the school children. Only faculty, staff and the parents of enrolled students should be permitted to deal with the children.
10. Have faculty been asked to keep personal supplies in their car trunks (change of clothes, comfortable shoes, warm jacket/sweater, personal comfort items)?
11. Have you established a maximum length of time that you will keep the school open while awaiting parents? People may be stranded at work for several days, and may be unable to communicate with the school. It has been suggested that after three days the principal evaluate the number of students remaining at the school and designate an appropriate number of faculty to stay with these children, and escort them to the nearest American Red Cross Shelter. Faculty can then stay with the children at the shelter in rotating shifts until all children are released to parents or other relatives or designated parties. If you need to take children to the American Red Cross Shelter, you should take along the emergency card which will assist the Red Cross in finding their families and making plans for reunification. (If permission is taken over the phone for release to a party not named on the card, have at least three people talk to the parent and receive the same message. All three witnesses then should sign a statement with the date and time of the parental instruction, their home addresses and their day and evening phone numbers. You must also get some personal identifying information from the parent that confirms their identity i.e., mother's maiden name, social security number, California driver's license number. If there is a dispute as to why the child was released to a certain person, this information and three witnesses should provide a defense for the school.

Pertinent information can be recorded on an "Emergency Action Checklist" and "Special Issues in Emergency Plan Implementation" form.

Annex H: Movement

The following are examples of elements to be considered in the development of this annex:

1. Location of likely American Red Cross shelters (usually high schools).
2. Plan for moving your school population to the potential shelters: a safe walking route (no overhead power lines, no tall buildings enroute, least likely traffic) and likely driving routes (no bridges, large structures that are likely to fall in the roadway).
3. Plan for moving immobile/disabled personnel/students.
4. Plan for moving severely injured. Do you have stretchers, backboards, cervical collars? Are personnel trained in moving the severely injured? Is there a vehicle that can hold the injured lying down (van, pick-up truck, bus)?
5. Plan for moving essential supplies. Have a wagon, wheel barrow, AV cart, lunch cart or similar vehicle in mind for transporting supplies to an alternate shelter site. Older children can help move supplies under the supervision of a teacher if the supplies are carefully packed in small quantities. Are essential medical supplies kept in a zippered or locked container that could be moved easily? Is there a series of backpacks or a suitcase with wheels to move essential student release supplies, including student emergency cards?
6. Develop a traffic pattern for school grounds. Building, floor and corridor wardens should be assigned.
7. Contact the Red Cross and the City if your school is a potential shelter site. If so, you will need to plan movement of the public on your grounds to the assigned "public" areas. Separation of students and the public is essential. Remember, your school is not a shelter until an American Red Cross representative has arrived. Until that time, liability for any injury on school grounds would lie with the school district.

Annex I, Rescue: Combined With Annex B

Annex J: Construction/Engineering and Utilities

The following are examples of elements to be considered in the development of this annex:

1. Develop a damage assessment team. Have them trained by city inspectors or a structural engineer with your specific building in mind. Special attention should be paid to portables and additions.
2. Develop a written damage assessment plan, including simplified building plans showing the critical areas for structural damage/integrity. (Your district engineer may have this information readily available. If not, ask the District to have this information developed by a District employee, or ask the City Building Department for assistance in developing the information. The State Architect's Office oversees all school construction, so they may be able to assist.)
3. Plan for simple repairs to expected vulnerable points in the building. For example, maintain a supply of boards and nails to board up broken windows. Have tarp and cord to substitute for broken doors or awnings.
4. Develop a plan for debris removal. Where can it be stored safely? Do you have a container for glass or other dangerous debris?
5. Know all utility shut-off locations. Ask utility companies for guidance on utility shut-off. Consider installing a gas shut-off valve. Make sure you have the proper tools for turning off the water at the street. Know where circuit breakers are located or how to remove fuses.

Pertinent information can be recorded on an "Emergency Action Checklist" and "Special Issues in Emergency Plan Implementation" form.

Annex K: Resources and Support

The following are examples of elements to be considered in the development of this annex:

1. Appoint a Supply and Procurement section.
2. Inventory possible sources of supplies during a disaster, and make arrangements to obtain materials if they are needed (letter of understanding, standing purchase order, etc.).
3. Allocate all emergency supplies.
4. Allocate essential personnel (other than pre-designated teams). Track personnel hours, injuries, and special assignments. Track volunteers by name. Maintain an accurate list of times worked and projects assigned. (Volunteers are covered by worker's compensation as long as they are registered.)
5. Consider possible sources of additional personnel, especially parents and neighbors of the school.
6. Obtain sources of transportation support. Maintain a list of bus and public transportation support. Maintain a list of bus and public transit companies, including 24-hour emergency contact numbers.
7. Allocate transportation resources during the emergency.
8. Develop a list of community resources that might be needed in an emergency. Be sure to include translator services, accounting services, medical personnel (nurses registry, walk-in medical facilities, medical office buildings), construction companies (for generators, lighting, temporary repair materials).
9. Update the resource list every six months. (This is a good job for PTA members or older students.)
10. Track all purchases, rentals, and expenses. Receipts are essential for federal reimbursement.

Pertinent information can be recorded on an "Emergency Action Checklist" and "Special Issues in Emergency Plan Implementation" form.

Emergency Action Checklist

Action	Assigned Responsibility	(x)

Special Considerations in Resources and Support

Principal:

School Nurse:

Faculty:

Parents:

Part VI

Steps for the Future

Next Step: Action

By Joyce Burris Bagwell
Director, Earthquake Education Center
Charleston Southern University

Introduction

In constructing an earthquake education program for a vulnerable audience, our school children, it is logical that the next step in planning should be to examine the goals and objectives set at this conference and refine them. Determine your commitment, and take proactive steps to integrate earthquake safety in the curriculum. The methods for accomplishing this task will be diverse, but the ultimate outcome should be to facilitate students' learning of life-saving behavior in the event of a damaging earthquake.

The purpose of this paper is to present five steps for implementing an earthquake education program to the school population. The steps, known as the five C's, are: (1) commit, (2) consult, (3) channel, (4) communicate, and (5) charge. Some of the methods I use to teach the concepts of earthquake history, causes, effects, and preparedness to school audiences will be demonstrated at the conclusion of my talk.

Commit

The advocates, individuals and agencies initiating earthquake education will commit their energies to the continuance of upgrading the quality of the earthquake education materials that exist. The advocates will commit themselves to explore every possibility through which the material can be utilized. The materials will be applicable to the target audience addressed. Accurate and practical information must be made available to the user/learner.

Assign the task to carry on the work only to those who have the qualities of being a "champion" for the cause of earthquake education. Enthusiasm, interest, professional expertise, and understanding the subject of earthquakes are qualities that the "champion" will possess. The importance of possessing a contagious spirit concerning the need for earthquake education will attract the attention of policy/decision makers who are able to produce institutional changes locally, statewide, and nationally. Commitment to educating the school population will open doors of opportunities. The only limit that an earthquake educational program has is the limit of the imagination and commitment of the program's leaders.

Consult

The work of the past decade in earthquake education will become a basis upon which to build. Consult people like Marilyn MacCabe of the Federal Emergency Management Agency (FEMA), who put together pilot earthquake education programs. Learn the technique of providing the concepts and allowing individuals to build upon them. The 1983 pilot projects funded by FEMA at the Baptist College at Charleston, Memphis State, and Seattle, Washington modified the materials of the Environmental Volunteers of California and CHES (Lafferty, Inc.) of California to be applicable for Charleston, Memphis, and Seattle. The activities of the plans and programs that worked well, and those that did not work well, should enlighten anyone implementing earthquake education programs in other states.

Become familiar with the programs in progress and learn where the nearest resource agencies are located. California is the leader in the United States for preparing and packaging earthquake education material. It is from the work done here that our programs in the east have learned the lessons for developing earthquake education materials. The Earthquake Education Center at Charleston Southern University modified the materials and made them applicable to

the eastern U.S. The difficulty which California and all other states face is to "educate" the populace so they know where their closest resources lie, what materials are available, and who to get to act upon their knowledge.

All the scientific research, challenges for the engineers, vulnerability studies, and mitigation plans for responders are vital, but the role of integrating earthquake education in the school population in order to plan and prepare themselves for a damaging earthquake is the important key to reducing the loss of lives in the event of a damaging earthquake in the United States.

We must learn to identify our resource agencies at the Federal, State, and Local levels and the products they can provide. In addition to the California resources, two outstanding earthquake educational programs completed recently in the east are *Earthquakes: A Teacher's Package for K-6,* developed by the National Science Teachers Association (NSTA) under contract to FEMA, and the *Guidebook for Developing a School Earthquake Safety Program,* written by FEMA. These resource materials are written specifically for the school population and are excellent.

As the educator, Robert Mager, made us aware, it is difficult to construct or map goals and objectives for where one wants to go unless one knows what has been done or accomplished in the past. Consulting with the beginning advocates in the field and researching the literature and programs are necessary beginning steps.

Channel

Everyone has limited energy and resources. For a program to be successful, there must be continuous channeling of energies. The concept of channeling here means focusing, and putting on blinders to avoid deviations or distraction. A magnifying glass concentrating the sun's rays in one spot upon paper can cause a fire. If the magnifying glass does not channel the sunlight in one spot, there is no concentration of heat generated, and no fire can be started. In the same analysis, unless the focus of one's goals and objectives upon an audience is concentrated or channeled, no lasting earthquake education program will be generated.

Channeling can be interpreted by some as following a chain of command. The procedure of following a chain of command in the educational system can eliminate embarrassment and problems for a program. Recognize, however, that one does not abandon a school district or a school if the person in charge does not want to become involved with the earthquake education program. Successfully implementing a program in another school or district nearby can cause changes in the thinking of those who at first were reluctant to participate due to the belief teachers would not want to participate. This actually happened in our earthquake education program. A teacher from the reluctant school, not knowing how the principal felt, participated in a hands-on earthquake program during the summer. She returned to her school and integrated the earthquake program in her class. She shared her materials with the other teachers. The school as a whole has not initiated an earthquake safety committee, but the students have been exposed to earthquake drills in the classroom. Hopefully, in the near future, the principal who did not think his teachers would respond to the earthquake education program will be calling us for more information.

The approach used by our Earthquake Education Center was successful because the science coordinators for the counties involved were 100 percent in favor of the earthquake education program. The science coordinators invited our staff to present the earthquake material in workshops. Teachers recognized the value of utilizing an interesting subject to enhance basic skills of the students. The interdisciplinary aspects of the subject stimulated ideas of ways to integrate earthquake safety for just about any discipline. Teachers like the hands-on experience that students were afforded in learning the what and why's of earthquakes. Several teachers have expressed the feeling of reward when students appeared to be stretching their minds beyond the natural "what if" questions. "What if" questions always get in earthquake discussion sessions. Teachers, "turned on" by the EEC programs, never failed to write or call for brochures, materials, films, slides, or to borrow some of the models the EEC had to loan.

Part VI - Next Step: Action

The proper channel for initiating an earthquake safety program can be through the teachers attending workshops, as well as the principals or the district level staff. Only those exposed to an adequate presentation of the material and enabled to see the far reaching effects of improving safety within their own environment are the ones who have taken steps to utilize the program.

Communicate

Communicate with those who are interested in getting earthquake education into the schools. All participants at this conference are aware of the importance of networking. Make a deliberate list of those associates who share the same interest and communicate with them often. By attending workshops, symposiums, and conferences, the chance to enlarge the network is increased with the added bonus of obtaining added information.

In the communication step, be prepared to spend time on the telephone, make appointments with individuals, and write notes to yourself so you will not forget or overlook anyone who is seeking information. There is a motivational book entitled *Rhinoceros Success* by Scott Alexander. The same concepts for a person to be successful, as this book indicates, are applicable to a successful earthquake education program. In your communication, choose to be audacious. Alexander states that success, in itself, is audacious. Do not become obnoxious; but to initiate a program where you live commands a daring feat to reach your goals. To convince educators that the possible threat of earthquakes requires initiating action plans for preparedness of an earthquake will be a major task anywhere because all Americans are convinced "It will not happen here." Your communication must convince others that you believe in the program.

Charge

You are a Niagara Falls of energy! With the power of the knowledge you possess concerning the importance of earthquake education in schools, you could easily light up Los Angeles. You have the knowledge of what needs to be done. Think big! Go to the decision makers within your state with a plan for sharpening the earthquake safety plan in your schools. Use your energy wisely. The Niagara Falls are not used for taking a shower. Exercise your discipline. Changing people's attitudes from a "what will be, will be" to a "what can I do to reduce the risk of getting hurt in an earthquake?" requires an impressive force from someone with a sound program ready to be executed. The scientific principle of inertia confirms that all objects tend to stay still unless acted upon by some outside force. A baseball will not pick itself up off the ground and throw itself. An outside force is required to put the ball in motion. We must be the outside force to have an adequate earthquake education program in our schools. We must fine tune ourselves to a degree of excellence. Each of us here must take the information presented and apply it to our own situations. With singleness of purpose, we must CHARGE!

Conclusion

The next step in earthquake education is to leave this conference with the determination to exercise the five C's. Commit to upgrading and utilizing earthquake curriculum materials and enlisting enthusiastic "champions" for the integration of earthquake science and safety into the educational curricula. Consult the leaders of the earthquake education programs in progress. Channel your energy toward clearly defined goals and objectives for school earthquake safety programs. Communicate often with colleagues concerning methods to implement earthquake safety to the school population. Present a positive approach. Charge forward! As leaders in the earthquake education programs for the school population, it is up to each of us to take action.

Appendices

A Planning Committee
B Roster of Speakers
C Conference Evaluation

Planning Committee

Committee Members

Ferne Halgren, Quake Safe, UCLA Extension

Katharyn E.K. Ross, National Center for Earthquake Engineering Research

Dr. Frances E. Winslow, City of Irvine Emergency Management

Logistics

Dawna Finley, City of Irvine, Chairman

Becky Eddy, City of Irvine

Registration

Becky Eddy, City of Irvine, Chairman

Roster of Speakers

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Appendix B - Roster of Speakers

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Dr. Robin Shepherd
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IMPLEMENTATION OF EARTHQUAKE PLANNING AND EDUCATION IN SCHOOLS: THE NEED FOR CHANGE - THE ROLES OF THE CHANGE MAKERS
May 16-17, 1990

EVALUATIONS OF THE WORKSHOP BY PERCENTAGES OF RESPONDENTS
No. of evaluations received: 36

Please assign a numerical value to each question or statement. A number 1 means that the item was of little value or was unsuccessful. A number 5 means that the item was very valuable or very successful. Numbers 2, 3, and 4 fall in a mid-range of values.

		Low 1	2	3	4	High 5
1. Did you find the conference to be useful for:						
a. Defining the need for earthquake preparedness planning in schools?	(36)*	0%	0%	0%	8%	92%
b. Defining the need for earthquake materials in the curriculum?	(35)	3%	6%	14%	9%	68%
c. Understanding the impact of earthquakes on building safety?	(36)	3%	0%	14%	30%	53%
d. Understanding the impact of earthquakes on children, staff and parents?	(36)	0%	0%	14%	28%	58%
e. Identifying resources for earthquake preparedness planning?	(36)	0%	0%	11%	31%	58%
f. Identifying strategies for implementing emergency planning in the school?	(36)	0%	0%	3%	28%	69%
g. Identifying currently available curriculum resources for earthquake education?	(32)	0%	3%	25%	25%	47%
2. Did you benefit from the conference in these ways?						
a. Learned strategies for implementing earthquake education from the faculty	(33)	0%	0%	12%	24%	64%
b. Learned strategies for implementing earthquake education from peers	(32)	0%	3%	0%	41%	56%
c. Gained a better understanding of the breadth of emergency issues that schools need to consider in emergency planning	(35)	0%	0%	0%	17%	83%
d. Became more comfortable with making a plan	(35)	0%	0%	11%	23%	66%
e. Became more comfortable with developing solutions for emergency management problems	(35)	0%	0%	0%	54%	46%
3. How useful were the following activities and materials?						
a. Introductory overview	(34)	0%	3%**	9%	23%	65%
b. Specialized workshops for target groups (principals, nurses, science coordinators, PTA)	(33)	0%	0%	6%	27%***	64%
c. Plan-making workshop	(35)	0%	3%	0%	23%***	71%
d. Plan-making notebook	(35)	0%	3%	9%	20%	68%
e. Packet materials	(35)	0%	0%	3%	26%	71%
f. Motivational talk on earthquake planning implementation	(32)	0%	0%	6%	19%	75%

* Number in parentheses indicates the number that responded to a particular question.

** Respondent noted 2 - 3.

*** Respondent noted 4 - 5.

IMPLEMENTATION OF EARTHQUAKE PLANNING AND EDUCATION IN SCHOOLS:
THE NEED FOR CHANGE - THE ROLES OF THE CHANGE MAKERS
May 16-17, 1990

4. Topics that should have been included that were omitted:

   1. Plans for adult centers.
   2. Substructures - with reference to nurses.
   3. How to deal with aftershocks - do we stay inside or out?
   4. Preschool workshop that would benefit schools without nurses and a small staff.
   5. How this planning process can apply to various disaster problems.
   6. Specialized topics for liability for superintendents.
   7. Highschools becoming Red Cross shelters.
   8. Not enough discussion on student release - it's a major problem area.
   9. More specific help with specific teams.
   10. Open forum for suggestions from participants (progressive planning), sorting out and working a plan one step at a time.
   11. How could schools handle the off-campus groups that use their buildings? (If an earthquake hit at that time - i.e. there's a church who uses two highschool sites).
   12. Correct way to do search and rescue in school setting.
   13. Session for other groups such as churches, infant care facilities.
   14. How to educate parents better.
   15. Use of students - (specifics) in drills, in disaster; monitored session for sharing forms, sources, etc.
   16. Giving reference list of Red Cross and colleges that will or are having first aid/CPR.
   17. General overview of planning guide and designating a notetaker in groups for planning - unique ideas should have been available to everyone.
   18. More details on how to motivate district's interest.
   19. Someone to talk briefly on acquiring a ham radio license and connecting with emergency services and other hams in area. More information for principals and preparedness coordinators (class ended at 3:30).

5. Topics that should have been omitted that were included:
   1. Red Cross
   2. Overview a little too long

6. Should there be a follow-up to this workshop?

Yes	93%
No	3% +
Undecided	3%

\+ Principal responded

IMPLEMENTATION OF EARTHQUAKE PLANNING AND EDUCATION IN SCHOOLS:
THE NEED FOR CHANGE - THE ROLES OF THE CHANGE MAKERS
May 16-17, 1990

Focus of Future Workshops/Comments

- Regional committee; how plans may overlap in serious disaster; include major businesses.
- More emphasis on actual "nuts and bolts" of equipment, communications, first aid, etc.
- Plan development.
- Evaluating plans and improving them. Entire seminar was wonderful/organization was great. Information gained from speakers and workshops were inspiring and useful.
- More specific information per school - another specialized workshop. I thought the program was wonderful - very organized! The speakers were so well educated.
- Very practical information. This has been an excellent how-to course. A great next step to the earthquake issue.
- Enjoyed and profited most when working in small group on Thursday morning. So pleased that we had more than one person from our school.
- How much of information that was used and have small rap groups.
- District awareness for our needs as just one site of many and getting them off the dime - to lead this education and materials needs procurement, accountability - to public and state - how can this be done?
- Media, hands-on. Have all participants share business cards for networking. The workshops, conference, speakers were great. Difficult to take notes when you have to write on your lap. The luncheons were great. Thanks for a very successful event!
- Report back on plans that were developed and tested. Use tables for all sessions. Overall rating (4.4, 1-5). Excellent conference, good food, good speakers (knowledgeable).
- Concentrate more on plan writing. Need xerox machine for exchange of materials, need adequate copies of speaker handouts, and would like class roster with phone numbers for after-conference contacts.
- Copies of all materials presented by different speakers should be made available. Portable copy machine with the capabilities to make copies of other materials for a small charge could be added.
- Excellent workshop; some information was repeated, but overall it was extremely helpful. Excellent keynote speaker.
- Since this is my first earthquake conference, everything was helpful for us in formulating a plan for our church. We want to be prepared if it hits while we are on one of the school sites. (Preschool teacher).
- Just for reference - the speaker on structural damage at the Red Cross Disaster Academy provided better information. The lady from South Carolina, excellent. How about the lady from FEMA, Washington, D.C. next year? How about Marilyn Quayle? - her mission is disasters.
- Should show specific plans for examination. Please include sessions for outside groups such as churches who use schools. Please include sessions for those who have infant care. Excellent presenters: Frances Winslow, Joyce Bagwell, Marilyn Boyd, Gloria Morrison.
- More specifics - need information on inservice training for staff. Do this again in the Fall. Our district is out of money in the Spring.

IMPLEMENTATION OF EARTHQUAKE PLANNING AND EDUCATION IN SCHOOLS:
THE NEED FOR CHANGE - THE ROLES OF THE CHANGE MAKERS
May 16-17, 1990

Focus of Future Workshops/Comments (Cont'd)

- Break down teams and do search and rescue team, first aid team, communications, etc. Distribute a model school plan with blanks to be filled in. Joyce from South Carolina was great! She is so creative.
- Search and rescue in school; first aid and search and rescue interactive workshops. Excellent seminar. I really enjoyed the speakers and learned a lot.
- Continuing education.
- Parent education.
- Walk-through school site; little more hands-on. Hands-on search and rescue techniques appropriate to schools; class roster; xerox capability. With a group this size, seating at tables would be best.
- Input as to implementation from this workshop.
- Principals and PTA personnel from all schools should attend. After drills are conducted, problem areas could be discussed. Can you offer information on damaged areas and clean up procedures following an earthquake? Offer the workshop in the fall and flood all schools with your data - I found out by accident!
- Evaluate completed plans.
- I thought there would be an opportunity to work on implementing/revising my school's current plan on Thursday to incorporate ideas we had heard about. I'm really sorry this wasn't provided. (Principal).
- Sharing achievements and networking (with copiers). We needed xerox machines of some kind for those who brought good ideas they've created for preparedness use.

NATIONAL CENTER FOR EARTHQUAKE ENGINEERING RESEARCH
LIST OF TECHNICAL REPORTS

The National Center for Earthquake Engineering Research (NCEER) publishes technical reports on a variety of subjects related to earthquake engineering written by authors funded through NCEER. These reports are available from both NCEER's Publications Department and the National Technical Information Service (NTIS). Requests for reports should be directed to the Publications Department, National Center for Earthquake Engineering Research, State University of New York at Buffalo, Red Jacket Quadrangle, Buffalo, New York 14261. Reports can also be requested through NTIS, 5285 Port Royal Road, Springfield, Virginia 22161. NTIS accession numbers are shown in parenthesis, if available.

NCEER-87-0001 "First-Year Program in Research, Education and Technology Transfer," 3/5/87, (PB88-134275/AS).

NCEER-87-0002 "Experimental Evaluation of Instantaneous Optimal Algorithms for Structural Control," by R.C. Lin, T.T. Soong and A.M. Reinhorn, 4/20/87, (PB88-134341/AS).

NCEER-87-0003 "Experimentation Using the Earthquake Simulation Facilities at University at Buffalo," by A.M. Reinhorn and R.L. Ketter, to be published.

NCEER-87-0004 "The System Characteristics and Performance of a Shaking Table," by J.S. Hwang, K.C. Chang and G.C. Lee, 6/1/87, (PB88-134259/AS). This report is available only through NTIS (see address given above).

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