

COMPREHENSIVE DISASTER PLANNING FOR EARTHQUAKES

Russell C. Coile, Ph.D., CEM
Disaster Coordinator
Pacific Grove Fire Department.
Pacific Grove, California 93950-3137
Tel (408) 648-3110 • Fax (408) 648-3107
E-mail russell@coile.com

ABSTRACT

California is not just "Disneyland" - it is also "Disaster land" with earthquakes, tsunamis, floods and fires. California is the largest in population of the 50 states with more than 30 million residents. It also seems to have experienced more disasters than any of the other states in recent years. Because of these numerous disasters, a system of comprehensive disaster planning for earthquakes and other disasters has been developed and implemented in California. "Comprehensive" means disaster preparedness planning by: individuals, families, neighborhoods, schools, cities, counties, the State, Federal agencies, non-governmental collaboratives of community based organizations, businesses and industry. Planning for large earthquakes requires a worst-case scenario with no warning, the chaos of damaged highways, damaged or collapsed buildings, no electricity, no gas, no telephone, no water, and no sewer systems. Fires usually add to the damage.

Pacific Grove is a small city but would serve as a well defined model for comprehensive disaster planning for earthquakes. First, the City has a disaster preparedness education program for individuals and families through local organizations and civic clubs, homeowner associations, local newspapers, and radio and television stations. Second, the local schools have active educational programs for disaster preparedness. The Fire Department has an educational trailer for teaching elementary children, and the Middle School has earth science courses to teach preparedness for earthquakes, oil spills and hurricanes. Third, the Fire Department has a training program for neighborhoods called "Volunteers in Preparedness" which organizes neighborhood emergency response teams including amateur radio operators. Fourth, all city employees are being trained in the State of California's new "Standardized Emergency Management System", adopted in December 1996. This new system is designed to facilitate one city providing mutual aid to another city, and one county providing additional resources to another county, with further

• backup from all over the State. Fifth, the Federal Response Plan will marshal the resources of 26 government agencies to help a state in a Presidentially-declared disaster. Sixth, non-governmental community-based organizations will be increasingly important. The American Red Cross not only has its key traditional role in providing mass care and shelter for earthquake victims, but here in California, is also assisting in the formation of collaborative associations of community-based organizations for disaster services. Seventh, California businesses and industries have learned the value of cost-effective business-continuity planning for efficient business recovery the hard way from past earthquakes.

The purpose of this paper is to provide a concise update on these evolutionary and revolutionary disaster management activities in California. There may be lessons learned from past earthquake disasters in California and the resulting development of our comprehensive disaster preparedness planning which might be interesting and appropriate for other cities.

INTRODUCTION

Individuals and Families

California has experienced two earthquakes and a variety of other disasters such as floods and fires during recent years. A system of "comprehensive" disaster planning evolved which starts with individuals. Ideally, individuals should take responsibility for their own mitigation and preparedness. They should consider what is feasible, prudent and cost-effective to do to prepare for disasters. Earthquakes provide a convenient scenario - no warning, damage to highways and buildings, no electricity, no telephone, no gas, no water, no sewer system, etc. Individuals should consider disaster preparations they might do at home, at the office, or en route in a automobile. Next, individuals should consider what disaster preparedness measures would be appropriate for their families. The Disaster Coordinator at the Fire Department gives disaster preparedness talks to local organizations such as the Rotary Club, Lions, Kiwanis, Pacific Grove Chamber of Commerce,

Meals on Wheels, senior citizen groups, mobile home parks, and homeowner associations. Earthquake preparedness is taught at the Pacific Grove Police Department's Citizens' Police Academy. Public education efforts also include articles written for the local newspapers, radio and television public service announcements, and special programs. The Pacific Grove Public Library has free earthquake preparedness literature in English, Spanish, Tagalog, Cambodian, Laotian, Chinese, Hmong, and Japanese.

Schools

The Pacific Grove Fire Department has a comprehensive program for teaching earthquake preparedness and fire safety to elementary school children in the first, second, and third grades. The American Red Cross' Northern California Disaster Preparedness Network gave a grant to the Fire Department to purchase an earthquake and fire safety trailer. This trailer is available for all the fire departments in the tri-county region of Monterey, Santa Cruz and San Benito counties to use at elementary schools. The trailer is actually a two story house built to scale to the height of the average six-year old child. The 1st, 2nd, and 3rd graders are taught how to telephone 911, the basic principles of earthquake preparedness, and how to "duck, cover and hold-on" under a table or desk. With one of the pupils upstairs in bed, the firefighter-instructor releases smoke simulating a fire. This activates a smoke alarm. The child is taught how to crawl, not run, to the bedroom door and how to always touch a door before opening it. The instructor can make the door warm, simulating a fire on the other side, so that the child does not open it, but finds an alternate escape route through a window. The children thus learn fire safety and are given appropriate coloring books and preparedness literature to take home for their parents to read to them.

Children in grades 6-9 in Pacific Grove are able to study disaster preparedness through a program called Event-Based Science. The National Science Foundation funded the Montgomery County (Maryland) Public Schools with a million dollar grant to develop event-based middle school science projects (Wright, 1995). The Exxon Valdez oil spill, the 1989 California Loma Prieta earthquake, and Hurricane Andrew are the focus events for the initial units called Oil Spill!, Earthquake!, and Hurricane! Each unit begins with about ten minutes of CNN news coverage of the disaster and *USA Today* news articles. The students carry out hands-on scientific experiments, complete challenging real-world tasks in cooperative groups with associated English, math, so-

cial study and technology aspects, and prepare comprehensive reports.

Neighbors

The Los Angeles Fire Department, and later the San Francisco Fire Department, decided to approach neighborhood associations to train neighborhood emergency response teams (NERT). The reason is that the Fire, Police and Public Works Departments will probably be overwhelmed in any large scale disaster. There may not be enough fire fighters to try to put out numerous simultaneous fires or rescue disaster victims trapped under earthquake rubble. There are 74 cities in central California now with training programs for neighborhood emergency response teams taught by instructors trained by the San Francisco Fire Department. There are 6000 trained neighborhood emergency response team members in San Francisco organized to report to 11 fire stations. In the city of Pacific Grove, we call our program "Volunteers in Preparedness". The program consists of six classes:

- Class 1 Earthquake Preparedness in the Home
- Class 2 Utility Control and Hazardous Materials in the Home
- Class 3 Disaster Medicine
- Class 4 Search and Rescue
- Class 5 Volunteer in Preparedness Team Management and Amateur Radio
- Class 6 Fire fighting training with fire extinguishers and training in rescue operations

The cost of materials for each student is \$30 for a hard hat, identification vest, and firefighting materials. The volunteers use amateur radio operators who live nearby to pass information to the City's emergency operations center. (Coile, 1997)

Cities

In October 1991 there was a disastrous fire in Oakland and Berkeley. This "East Bay Hills" fire caused 25 deaths and 150 injuries. There were 3,354 houses and 456 apartments destroyed. This was the worst urban fire in the history of the United States with an estimated cost of \$1.5 billion.

According to the official "lessons-learned" report prepared by the East Bay Hills Fire Operations Review Group, a number of factors contributed to poor performance by the Oakland and Berkeley fire departments. The weather made firefighting almost impossible with high temperatures of 92 degrees Fahrenheit, low relative humidity of 16 percent, and strong winds of 30 knots

gusting to 50 knots. The streets were narrow and clogged with the burned-out hulks of a thousand automobiles.

There were also important organizational problems. The Oakland Fire Department did not use the Incident Command System and had no formal mutual aid agreements. The Fire Department moved its command post to three different locations during the fire, while the Police Department established two different command posts. It was difficult for the Governor to find out who was in charge and what was going on. Furthermore, the Oakland Fire Department had a different size fire hydrant coupling from other California cities so that mutual aid engines from other cities needed to use an adapter which was in short supply. The Oakland Fire Department's budget had been cut so much in the preceding ten years that about 40 % of the personnel had retired without replacement, and there had not been money for wildland fire-training. With little money for modernization, the fire engines had antiquated four-channel radios instead of more modern sixteen-channel radios. This made it difficult to communicate with the 300 mutual aid fire engines which had arrived to try to help.

State Senator Petris, whose home in Oakland had been burned, prepared the draft of Senate Bill 1841 which was approved by the state legislature and signed by the Governor. This law is found in Section 8607 of the Government Code. The intent of the law is to improve the coordination of state and local emergency response in California. The new "Standardized Emergency Management System" (SEMS) was effective December 1, 1996.

SEMS Training

Because this is a new system, a comprehensive training program was developed for all emergency personnel. Four courses were developed by the Governor's Office of Emergency Services and all city, county, and state employees were to get appropriate training.

Basic Components of SEMS

The new Standardized Emergency Management System was based on improvements to existing systems and some new concepts. These components are:

- The Incident Command System (ICS) - The ICS as developed by FIRESCOPE will be used at the field level by all responders.
- Multi-Agency Coordination - Multi-agency coordination is the coordination among different agencies within a jurisdiction, such as Fire and Police. Inter-agency coordination takes place between different levels, such as city police, county deputy

sheriffs, state police and California Highway Patrol officers.

- A Master Mutual Aid Agreement - State, counties and cities originally signed a master agreement in 1950. This has been further developed to cover fire, law enforcement, coroner, emergency medical and search and rescue systems.
- Operational Areas - An operational area consists of a county and all political subdivisions within that county's area.
- The Operational Area Satellite Information System (OASIS) - A satellite communications system with a high frequency radio backup installed at each of the 58 counties, the regions, and the State.

Counties

California is divided into 58 counties and each county with all of its cities and special districts became an operational area for disaster purposes on 1 December 1996. SEMS organizes mutual aid so that one county may provide a city in distress with mutual resources from other cities.

State

The Governor's Office of Emergency Services at the State level established three Regional offices for disaster administration. The Coastal Region emergency operations center in Oakland can request resources from other counties to help the counties surrounding Pacific Grove.

Federal Government

The Federal government has a Federal Response Plan to coordinate the disaster activities of 26 agencies. The Federal Emergency Management Agency (FEMA) is in charge of these efforts and will coordinate federal assistance with the State.

Non-governmental community-based organizations

The American Red Cross provides mass care and shelter to disaster victims and Red Cross volunteers have raised money to pay for providing temporary shelter, meals, clothing, and essentials to earthquake victims to help them recover from disasters. Now, the local Red Cross chapters in California have been given grants to help organize the numerous non-profit organizations such as food banks into community collaborative associations for coordination of disaster activities. There are more than 400 such non-governmental organizations in Monterey County. The Red Cross chapters are assisting them in writing disaster plans and preparing for collaborative activities.

Business and Industry

Cost-effective and prudent disaster preparedness mitigation activities are underway in many businesses and industrial organizations. What started with an emphasis on contingency planning for computerized accounting systems by off-site storage of backup computer files has blossomed into thorough business recovery disaster planning.

Training

The State of California has an annual statewide earthquake exercise scheduled for the first Tuesday of April each year. For example, the announcement for the 1997 exercise in the City of Pacific Grove was as follows:

STATEWIDE EARTHQUAKE EXERCISE, 10:30 A.M., APRIL 1, 1997

1. The City of Pacific Grove will participate in the State of California's earthquake exercise scheduled for Tuesday, April 1, 1997. The City's emergency operations center will be activated at 10:00 a.m. at the Community Center, 515 Junipero Avenue.
2. The exercise will proceed in the context of a "BIG" earthquake. It will be assumed that the following conditions will prevail after 10:30 a.m.:
 - No electrical power
 - No gas
 - No telephone service and cellular service is overloaded
 - Water pipes broken
 - Sewer pipes broken

Earthquake damage to local highways, to bridges over the Salinas River, and to overpasses and underpasses on Routes #1 and #68 has resulted in access problems. Earthquake damage to PG&E power generating stations at Moss Landing and other locations, and to switching facilities and transmission lines has resulted in a lack of electrical power for Pacific Grove (scenario assumption - loss of power for one week.) Earthquake damage to telephone switching facilities and telephone lines has resulted in an initial lack of regular telephone service. (scenario assumption - no telephone service of any kind for one week). Earthquake damage to water, sewer, and gas pipe lines has been widespread in Pacific Grove (scenario assumption - no resumption of services for two weeks). Earthquake damage to unreinforced masonry structures has been extensive. Earthquake damage to housing has resulted in approximately 17% (Kobe, Japan experience) of the population of Pacific Grove displaced from their homes and 10% of these requiring tem-

porary shelter and feeding, (scenario assumption - Residents needing shelter 274). Earthquake damage has resulted in 0.35% of the population (Kobe experience) in Pacific Grove dead, and 2.34% injured (Kobe experience), requiring first aid and/or hospitalization, (scenario assumption - Dead: 57, Injured: 377).

3. Preliminary planning for the exercise includes the following events:
 - 10:00 a.m. Activation of the City's emergency operations center at the Community Center, 515 Junipero Avenue, based upon an earthquake prediction message received from the State OES.
 - 10:30 a.m. Earthquake !
 - The City of Pacific Grove's Damage Assessment Team may be activated under the direction of the Chief Building Inspector and begin damage assessment surveys.
 - The following organizations may conduct an earthquake evacuation exercise after the 10:30 a.m. earthquake:
 - Hopkins Marine Station, Stanford University
 - Monarch Pines Homeowners Association
 - The Monterey County Chapter American Red Cross in Salinas will send a shelter management team and an emergency response vehicle (complete with amateur radio station) to Pacific Grove. The team has a Red Cross trailer which contains cots, blankets and comfort kits. Monterey County Red Cross may need to request mutual aid assistance from the cluster of nearby Red Cross chapters, such as Carmel-by-the-Sea and Santa Cruz.
 - The Monterey Bay Search Dogs, Inc. will be requested to provide urban rescue search dogs to find survivors buried alive in (pretend) earthquake rubble of collapsed buildings. The search operation will be conducted at the City's Corporation Yard, 2100 Sunset Drive at 11:00 am
 - Radio station KOCN will set up a portable remote facility at the emergency operations center so that the Mayor and City Council members can make live broadcasts to residents of Pacific Grove.
 - Pacific Grove amateur radio operators will set up amateur radio stations at the emergency operations center, at evacuation sites, at the search dog operation site, at Community Hospital, and

at Red Cross shelters.

- The Salvation Army will activate its headquarters amateur radio station in Seaside and send its emergency canteen vehicle to Pacific Grove to provide coffee and lunch to disaster workers at the emergency operations center.
- Troop 90, Pacific Grove Boy Scouts will provide scouts for duty as pages at the EOC to deliver messages, run errands, escort visitors and assist with security.
- The Volunteers in Preparedness (VIP) neighborhood emergency response teams who are registered disaster service workers will be activated in their respective neighborhoods. These teams, assisted by assigned Boy Scouts and amateur radio operators, will collect preliminary damage information in their neighborhoods and report by amateur radio to the EOC. The VIP teams will conduct search and rescue operations in their neighborhoods as well as provide emergency utility control, disaster medical attention, and assistance to earthquake victims.

CONCLUSION

The State Geologist has estimated a 67% probability that a large earthquake of the magnitude that damaged San Francisco in 1906 will occur in California within the next 30 years. Many residents take this prediction seriously and have undertaken prudent disaster preparedness activities. In our small city, a comprehensive program has been adopted. Children are shown the basics of earthquake preparedness and hopefully carry the messages back home to their parents. Middle school students are old enough to carry out student projects and learn important facts for themselves. The Volunteers in Preparedness training program for adults and high school students teaches them fire fighting and rescue techniques. Residents learn how to organize their neighborhoods and work with the amateur radio operators who live nearby.

These evolutionary and revolutionary developments in California are based on honest efforts to remedy shortcomings in mitigation, preparedness, response and recovery revealed in past earthquakes, fires and floods. The State of California has used the introduction in 1996 of the new Standardized Emergency Management System to emphasize the importance of disaster preparedness, planning, and training for all state, county, and city employees

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- San Francisco Fire Department, Neighborhood Emergency Response Team Training Office, 260 Golden Gate Avenue, San Francisco, CA 94102-3706 (415) 558-3456 fax (415) 928-3130
- Nert Student Manual and other information. (<http://www.slip.net/~nertsffd/>)
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