Unacceptable Risk: Earthquake Hazard Reduction in One California School District

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The Mitigation Milieu

It is not surprising, in light of all the pressing problems school administrators have to contend with these days, that school emergency preparedness and hazard reduction are frequently overlooked. Those concerns must compete with a host of other serious issues for the time and attention of the administrator. If there are barely enough hours in the day to deal with immediate complications and questions, simple arithmetic explains why random events that *may* strike at some unspecified time in the future do not compel much administrative action. However, there is more to starting a successful school emergency preparedness than merely getting past administrative distraction or neglect.

Even when an administrator does attend, for one reason or another, to emergency preparedness, he or she must do so with resources and time that can usually be spent on more pressing problems - at least as they are defined by other groups with differing interests and concerns. And those other groups will make it difficult over time to keep on spending money and staff time on planning and mitigating hazards - not certainly because they are malcontents or troublemakers, but because they will continue to push for their causes. And almost nobody, including the administrators, appreciates that a comprehensive preparedness and hazard reduction program can take a long time to put in place and involve almost *everyone* in the district.

It is a commonplace of hazards research that disasters don't change, but actually exacerbate, the social processes in a community or organization. For instance, if a community has inadequate low-income housing and regular conflicts over how to remedy that situation, then a disaster will make the problem worse - it will reduce the low-income dwelling units further and heat up the public discussion on what to do about it. It is equally true to say that hazard mitigation initiatives *before* a disaster exacerbate social dynamics: efforts to reduce vulnerability to loss will intensify debate over nearly all the pertinent social issues, some not even necessarily related to hazards or their reduction. In a school district, for example, with a history of busing difficulties, teacher pay disputes, or bilingual education controversies, an administrative decision to reduce earthquake risk in the district's buildings will not only encounter the usual obstacles related to money expenditures, but may very well raise all those other ghosts before the project is completed.

In short, plans are not made nor hazards reduced in a vacuum. Preparing for a school emergency is not like buying a new software package and installing it quickly on the central computer. Emergency preparedness has most to do with organizing people, and that is always complex and time-consuming. Any school preparedness initiative that does not recognize that is doomed - if not to failure, then to unfinished business.

The school board and administration of the Berkeley, California, school district decided, not long after the Loma Prieta earthquake, to spend some money to plan and prepare thoroughly for another earthquake; however, when the decision was made, those administrators had no idea that the earthquake preparedness initiative would end up affecting, and being affected by, nearly every other pressing problem they had been dealing with. Neither did they

dream it would take as long and cost as much as it has. To their credit, the board, administration, and some dedicated parents have kept at the job they started, though it has become extremely difficult. The case study below illustrates how the plot thickened.

Wake-Up Call

In Berkeley, the Loma Prieta earthquake alerted a number of parents to how poorly prepared the school district was for a major quake. Fortunately, the October, 1989, earthquake struck after schools had discharged most of their students for the day, but the disorder caused in Berkeley by stoppages in electricity and phone service alone gave a few observant people a good idea of the chaos that would have resulted had the schools been in session. A few inquiries to individual schools in the Berkeley Unified School District (BUSD), and to the Superintendent's office, revealed that emergency plans were out of date, teachers and staff weren't trained in disaster response, alternate communications equipment was scarce and outmoded, and there were precious few first aid, water, or food supplies anywhere.

The concerned parents formed a special PTA Council sub-committee that took its concerns to the Superintendent and the School Board. After a few months of lobbying and education by the sub-committee, the School Board voted in February of 1990 to implement a comprehensive earthquake/disaster preparedness program; it approved a budget of $193,000 out of reserve monies to fund it. The Board had been persuaded that Berkeley's proximity to the Hayward fault, with its U.S. Geological Survey-assigned 45% probability for a damaging earthquake in the next 30 years, was a compelling reason to upgrade its readiness for disaster.

Comprehensive Preparedness

Among the points made by the PTA Council sub-committee was the legal wisdom and practical sense of complying with a California law in place since 1984 - the Katz Bill (California *Education Code* Section 35295, *et seq.*) - that requires school districts to plan, prepare and train staff and students for earthquake safety and response. Since no monies had ever been appropriated by the State Legislature to support school compliance with the law, few schools had found the money or time to do much. Nonetheless, the sub-committee emphasized, failure to have done anything at all would certainly increase BUSD's liability should a future damaging earthquake cause deaths or injuries in any Berkeley school. Following both the specifications of the Katz Bill and the recommendations in the 1989 *Report of the Earthquake Preparedness Task Force*, by the California State Department of Education, BUSD undertook the following tasks:

- A comprehensive, district-wide disaster preparedness plan and site-specific plans for all 19 schools and all departments.
- Training for all staff in the elements of the plans, as well as an instruction program in first aid and CPR staffed by District personnel.
- Emergency and medical supplies for all school sites, back-up communications equipment using a variety of power sources, and two day's worth of food and water at each school.
- Structural and nonstructural hazards assessments to be completed at each school.

The School Board also appointed the highly motivated parents of the PTA Council sub-committee as a special task force. Its charge was to monitor the preparedness process and BUSD's efforts; the task force worked with administrative staff advisors to make real the School Board's intent. The task force members contacted other school districts in California to determine their plans and strategies. They also consulted with the Bay Area Regional

Earthquake Preparedness Project, (BAREPP) a jointly funded FEMA/State of California project located in Oakland, for information on earthquakes and preparedness; at BAREPP, they spent hours educating themselves to the state of the art by poring over reports, sample plans, risk maps, and vulnerability assessment manuals.

In a few months, BUSD came up with a practical program that suited the community's unique needs. *The Earthquake Disaster Response Plan* was drafted by a planning consultant who had worked closely with district administrators, school principals, and other involved staff members. As stated in its introduction, the user-friendly document is:

> ..designed to provide a framework for protecting students, staff, and school facilities, as well as for organizing the response by school district staff to emergency earthquake/disaster situations...The Plan is designed to improve the ability of school district staff members to rely on themselves and each other to respond effectively without the immediate aid of government responders.

The comprehensive plan outlines the tasks of teams at each school site, the roles various departmental personnel will play in a disaster, and the running of an emergency operations center. The overall plan also lists disaster resources and provides for dispersal of resources from various departments to individual schools. The site-specific plans allow staff at each school to be relatively self-sufficient in the immediate aftermath of a disaster.

Structural Surveys

The preparedness budget also included monies for structural and nonstructural hazard surveys of all school sites. A structural survey consists of an examination of the elements that function to hold up a building - the foundation, load-bearing walls, columns and beams, and roof diaphragm. The nonstructural surveys identified that area also known as "content hazards:" book cases, file cabinets, light fixtures, ceilings, and glass windows. Such items are plentiful in schools and can be extremely dangerous when they are put in motion by an earthquake. Occupants that do not (or cannot) duck and cover during the shaking, run a very high risk of being seriously injured or killed by nonstructural items falling down, tipping over, or flying through the air.

Although public schools in California have been built to stringent seismic design codes since the Field Act was passed in 1933, some of the older buildings (typically constructed before 1976) concern the Office of the State Architect, the state agency that regulates school construction. Although the older Field Act schools were built to the standards of the day, those standards have changed over the years in light of everything engineers and architects have learned about building behavior in earthquakes. A school that met 1955 Field Act design and construction regulations might not meet the 1991 regulations; in an earthquake, the structure could fail in a way that would threaten the safety of the occupants. Especially problematic are the multi-story, non-ductile concrete frame buildings built in the 50s and 60s, but found to perform badly in earthquakes such as the 1971 San Fernando quake and subsequent damaging events.

All the BUSD structures are official Field Act schools, but legal compliance does not guarantee structural safety. The Office of the State Architect is about to begin an evaluation of "buildings currently in use as public schools that were built under outdated code provisions not allowed today." However, such a study of California schools will take years, and BUSD did not feel it could wait that long to protect its buildings, students, and employees. In light of its questionable structures - because of their ages, their type, or their locations near the Hayward fault - the School Board decided that the prudent course of action was to hire its own engineers to evaluate all the school buildings.

In so doing, BUSD has opened public discussion of what may prove to be a significant facilities issue for *all* California school districts. Though the California Seismic Safety Commission and the Office of the State Architect have been questioning the structural integrity of the older Field Act schools for some years, no school district had

actually moved *before* an earthquake to determine whether it had hazardous individual buildings. Neither had a school district requested state funds to help retrofit hazardous buildings. Berkeley is like many other small, urban districts in California. it consists of typically old school buildings, many of which are questionably safe, and has virtually no funds for making significant building improvements.

The building evaluation was begun in June of 1990 by a structural engineering firm that BUSD had used in previous facilities work. The first schools to be inspected were six that had been found to have potential structural problems in a 1978 evaluation. The engineers used the assessment framework provided in a recent publication of the Applied Technology Council, *A Handbook for the Seismic Evaluation of Existing Buildings.* Also known as "ATC 22," the book represents the state of the art in structural vulnerability analysis. The examination revealed that two elementary schools, Cragmont School and Whittier/Arts Magnet School, had structural elements that could fail in a major earthquake. Both schools are non-ductile concrete frame buildings. Cragmont, the flagship of the Berkeley fleet, was built in the 1960's very near the Hayward fault.

This report was delivered by the engineers just as a new Superintendent began her tenure and the school year commenced in the Fall of 1990. On literally her first day on the job, LaVoneia Steele was handed a problem that no one had really anticipated nor warned her about. That it was to grow even larger as the months progressed, and all the schools were structurally evaluated, would have been equally surprising to all concerned. The School Board quickly requested review of the engineering reports by the Office of the State Architect. OSA concurred with the private engineering evaluation and BUSD was advised to relocate students and plan to retrofit the two hazardous school buildings.

This gave rise to lively debates in each school's community. Parents who were concerned about their children's safety disagreed with parents who were more concerned about moving their children or breaking up classes. Teachers and staff members had similarly conflicting opinions. It was proposed that students and staff from Cragmont be relocated in November to Franklin School, a facility some distance away that had not been used for some years, but was found to be seismically safe. Franklin, however, is in "the flats" and Cragmont is in "the hills," a distinction in Berkeley which evokes memories of past disputes over integration, busing, quality and kind of instruction, and equal access. Very quickly, the discussion was complicated by numerous issues other than seismic safety

Part of the Whittier/Arts Magnet population was relocated to portable classrooms on the school grounds in March of 1991, amid heated deliberations over the safety of the portables, both seismically and in terms of trace hazardous materials found in their walls and floors by the school district's environmental protection officer. Heavy equipment was brought onto the school grounds to prepare the site for the "bungalows" and the noise and dirt created thereby became a great source of distress and distraction. Teachers claimed that for every decibel increase in noise, there was a decrease in student attention span.

Obviously, not one decision was simple, nor did it have to do *only* with earthquake safety. Every one was entwined with other matters· widely varying perceptions of the earthquake risk. parental concerns over both their children's safety *and* the potentially negative effects of displacement and busing, teacher commitment to quality instruction, the cumbersome processes necessitated by the involved state agencies, divergent interpretations of the engineering reports, the inevitable resistance of people and groups to change, and, certainly not least, the district's monetary constraints. However, issues of public safety and legal liability impelled the School Board to make the initial decisions about closure, relocation, and retrofit without actually knowing where the funding ultimately would be found.

Money and Logistics

The School Board recognized even before all the engineering reports were in that more than two school buildings could be found unsafe. In order to obtain financial help in what could prove to be a multi-million dollar retrofit project, BUSD applied in October of 1990 for State Allocation Board (SAB) grants to "modernize" the seismically unsafe portions of the two schools already found to be hazardous. The State Allocation Board is a state agency that oversees school facilities funding in California. The chief concerns of the SAB with respect to Berkeley's request were that funding Berkeley would set a precedent for other urban school districts in California to ask for retrofit money. It was thought to be a most inopportune time for the State of California to be setting such a precedent as it was becoming clear that the state budget deficit was approaching $13 billion. The legislators had not begun to determine how to balance, as they must, the state budget.

The District also applied to the Federal Emergency Management Agency (FEMA) for hazard mitigation grants to support the Cragmont and Whittier/Arts Magnet retrofit projects. In the counties affected by the Loma Prieta earthquake, FEMA offered matching funds to jurisdictions and to public and private sector organizations proposing hazard reduction projects. BUSD has received preliminary approval of $1.1 million in matching funds for the retrofit of Cragmont school. In making the award, FEMA cited Cragmont's risk of collapse and the fact that it functions not only as a school, but also as the focus of many community activities; additionally, it may be needed as a public shelter following a future damaging earthquake.

In February of 1991, the School District received the structural engineering reports for the rest of its school sites - and the news was not good. The engineers had identified significant structural deficiencies in six additional buildings. Three more elementary schools were found to be *potentially* hazardous, two of which are non-ductile concrete frame buildings. The non-ductile concrete cafeteria at Berkeley High School was ranked as a serious collapse hazard, and the science, shop, and swimming pool buildings were found insufficiently stable to resist major ground shaking. Buildings housing the continuation high school and the adult school were also tagged by the engineers for potential problems.

As soon as the School Board received the engineering reports, it alerted each affected school. Each site *had* established a seismic safety committee, composed of staff, parents, and the principal, to act as liaison between the School District and the community. Those committees were charged, first, with reviewing the report on their school, and then suggesting solutions to the short-term critical problem of safely housing all children and staff in seismically sound buildings. School District administrators and the engineers met with parent, union, and staff groups to answer questions about the reports and to gather information from the community about how best to proceed in each case.

This was at about the same time the district was negotiating with the teachers union over the next three-year contract. In the midst of the raise proposals and the cost of living counter-proposals, it was suggested (incorrectly) by someone that the district had taken the first $193,000 for seismic safety out of the same funding category from which teacher raises should come. The teachers threatened to walk out if they were not given a raise. In fact, they never did, but the possibility added yet another entanglement for the seismic safety proponents. Before the final agreement on a 3% raise was reached, both the original appropriation for earthquake safety was called into question, as were all subsequent expenditures.

Not too surprisingly, in April of 1991, the SAB turned down the Cragmont project on the grounds that the building is under 30 years old, and therefore not eligible under SAB policy guidelines for modernization. The SAB suggested that BUSD apply for the use of state-owned portable classrooms to accommodate the students in buildings found to be unsafe. Repair of the Whittier/Arts Magnet school building was funded as a modernization project, but usually projects in that program are not allowed to use more than 5% of total monies for *structural* rehabilitation. The total expenditure on modernizing a school building is not to exceed 75% of the building's total replacement value, and the

potential costs for Whittier/Arts Magnet could approach that cap. The SAB will make its final decision on fund availability when engineering calculations and architectural drawings are completed for the school.

Planning Ahead

As it happened, the School District was also engaged in a long-term strategic planning effort that would, it was hoped, provide a map of activities for the next ten years. Under the circumstances, a team of staff and community members was included to address the District's facilities crisis. The team was charged with determining what sort of school facilities the community would want, whether they were small, neighborhood schools or a corridor of larger schools in the central portion of the city. The primary planning assumption is that all students should be housed in seismically safe buildings, but even that premise is encumbered with other considerations. Some parent groups would prefer to have their children in the seismically questionable school buildings in their neighborhoods rather than in portables or safer school structures across town; other groups are happier to have their children out of the potentially dangerous buildings, but are not too enthusiastic about the portables.

While the strategic planners continue to define the long-term facilities goals, a small staff group in the District offices has taken all the suggestions from individual sites, factored them in with other financial and administrative constraints, and attempted to formulate them into a solution to the short-term problem of getting students and staff into safe buildings. The Superintendent will soon present to the community and the Board of Education a plan for placing people in the buildings with the least potential for structural failure, for reducing collapse hazards where economically and structurally feasible, and for relocating students into safe buildings or portable classrooms while the retrofit work is underway.

A not inconsiderable problem for the School District is paying for even student relocation costs. For further reconstruction efforts, BUSD will have to raise monies at the local level - and, as already mentioned, some voters in Berkeley are not convinced the structural upgrades are necessary. Nonetheless, some long-term financing schemes will have to be instituted to pay for facilities upgrades necessary in Berkeley's schools, only one component of which is seismic. It will be necessary to float a bond issue. One potential course of action is to offer one in 1992 for a ten-year phased reconstruction plan.

Pandora's Box

The Berkeley Unified School District has made great progress in preparing for earthquakes and reducing its hazards. In many respects it can serve as a seismic safety model to other districts and communities. The combined efforts of the parents, the teachers, the School Board, Superintendent, and District staff have been exemplary. However, many tasks remain: the fine-tuning of the plans, the continued funding of the preparedness and training aspects of the program, carry out drills and exercises, the reduction in the nonstructural hazards, the development of a disaster recovery plan, and the need to obtain and store securely supplies and equipment. Additional troubling questions remain about the use of schools as community shelters after an earthquake or other disaster. For example, can educational operations be resumed in schools that are also occupied as shelters? If not, where can the students be put?

The need to relocate students while buildings are retrofitted is another nagging problem. But the biggest imponderable, how all the structural repairs will be paid for, is in a category of its own. There was recently an article in the newsletter of the BUSD teacher's union detailing all the thorny issues that have been raised by the school district's embarking on the structural evaluations of the schools. The writer likened the current situation to that which was obtained after Pandora opened the forbidden cask and set loose all the woes and strife that bedevil humankind. What the newsletter writer forgot to mention, however, was that after all the evils had been released, Pandora looked into the cask and what remained was the faint, but pure, light of hope.

For more information about Berkeley Unified School District's approach, plans, or experiences, contact *Arrietta Chakos, Facilities Grants Liaison, Berkeley Unified School District, 2134 Martin Luther King Jr. Way, Berkeley, CA 94704-1180, (415) 526-7904.* To learn more about California school preparedness requirements and model plans, contact *Sarah K. Nathe, Resource Coordinator, Bay Area Regional Earthquake Preparedness Project, 101 8th Street, Suite 152, Oakland, CA 94607, (415) 540-2713.*

Berkeley's newest school, Cragmont, is a non-ductile concrete frame building. Features of its construction include cantilevered sections and a partial soft story.