Chapter 4
TYPICAL SOCIETAL ISSUES IN SEISMIC REHABILITATION

Because rehabilitation deals with existing and usually occupied buildings, the range of socioeconomic issues likely to be encountered — and needing to be solved — can be formidable. Moreover, the intensity, nature, and complexity of such problems will vary somewhat from building to building even though sections or neighborhoods of cities and towns slated for seismic rehabilitation will have common problems depending on the demographic and socioeconomic characteristics of the designated areas.

This chapter breaks the overall forest of issues down into trees (at least the socioeconomic and administrative ones) that commonly arise in seismic rehabilitation programs. Each subject is discussed in terms of the nature of the problem, typical issues likely to arise in connection with that problem, and some possible ways to solve or at least ameliorate the negative impacts of the problem. It is an axiom that the lower the level of conflict, the easier it is to first adopt and then implement measures that have retroactive characteristics.

The first section of this chapter discusses demographic, social, and economic factors while the second section treats public policy and administrative issues typically involved in seismic rehabilitation. For example, ownership patterns, income levels, historic properties, and occupancy characteristics are contained in the first section while policy formulation and adoption strategies and legal and program management issues are included in the second section.

An overriding concern in seismic rehabilitation has to do with accommodating the building's intended use. Obviously, all design professionals know they have to accommodate the owner's intended uses of the candidate building. However, seismic rehabilitation projects often are technically tricky and part of their success depends on achieving an effective balance between improved earthquake safety and functionality. A related FEMA publication (FEMA 172, p.17) notes that:

> Most buildings are intended to serve one or more functional purposes (e.g., to provide housing or to enclose a commercial or industrial activity). Since the functional requirements are essential to the effective use of the building, extreme care must be exercised in the planning and design of structural modifications to ensure that the modifications will not seriously impair the functional use.

DEMOGRAPHIC, SOCIAL, AND ECONOMIC FACTORS IN SEISMIC REHABILITATION

Because existing buildings were built to earlier standards and often are occupied, a wide spectrum of social and economic problems may be encountered when seismic rehabilitation is considered. Some or all of them may arise during the project planning process. The most significant topics are discussed below: the distribution of impacts on various segments of the community; means to minimize business interruption, occupancy dislocation, and the loss of housing; the treatment of historic properties; and approaches for financing seismic rehabilitation. For example, when San Francisco examined socioeconomic factors related to its URM buildings, it found that 7 percent of the businesses were in URMs, 7.5 percent of jobs were in URMs, and 7 percent of the URMs provided housing, even though only 3.7 percent of the city's residents lived in URMs.

Evaluating the Distribution of Impacts Due to Seismic Rehabilitation

Nature of the Problem: Seismic rehabilitation affects people differently. There are organized interests that may become mobilized, and there are latent

ones that may emerge during the process of formulating seismic rehabilitation policy as well as around specific projects. Chambers of commerce, merchants associations, local design professionals, and boards of realtors are examples of formal interests while building owners, loosely structured neighborhood groups, or even tenants within individual structures may organize around a given project.

It seems clear that supporters of seismic rehabilitation may be a coalition of local and distant design professionals, building officials, and others committed to seismic rehabilitation, but the opponents most often are totally local, those whose immediate interests are most likely to be directly affected. It is important, therefore, to anticipate the composition and range of interests of the coalitions that might form and to evaluate what the impacts will be on each and how each will perceive and therefore react to proposed seismic rehabilitation programs and projects.

Typical Issues: Several key issues will arise in virtually every seismic rehabilitation policy development process:

What is the scope of the seismic rehabilitation effort? It matters greatly if the project is one building, a well defined portion of the city (e.g., "Pioneer Square"), a concentrated or evenly widely distributed class of existing buildings (e.g., URM bearing wall structures), or a targeted use (e.g., theaters and churches). The scope of the seismic rehabilitation program will define the interests most likely to become involved in the process.

What existing local groups are likely to become involved, and what will be their particular interests in seismic rehabilitation?

Can support or opposition be expected from latent interests that might define seismic rehabilitation as an issue?

What work will be required, how much will it cost, and when must it be completed?

The answers to these questions define the potential intensity of the interests' positions.

Solving the Problem: Several actions can be taken to anticipate the impacts of and the interests likely to be affected by seismic rehabilitation projects and programs. Some suggestions include:

Identify government agencies, community groups, and professional and business associations that historically have played key roles in planning and zoning, redevelopment, building code, housing, and related issues. This information often can be obtained from local agencies. Review the positions taken and attitudes expressed by these groups on related issues.

Identify latent or emergent groups that may or may not have been actively involved in the past but that could become so depending on the focus of the seismic rehabilitation program. This may be more difficult than identifying formal groups, but it is worth the effort because unexpected vocal opposition, even from a small but highly visible group, can have serious consequences for proposed projects.

Hold well announced community meetings to introduce the concept while the program is still in the formative stage. One effective mechanism is to then form a "Community Advisory Committee" whose members represent all interests. This group then can examine the issues in a common framework and perhaps reach consensus on critical issues. Community meetings and advisory groups require extensive technical and staff support, and this workload should be anticipated.

Inform the local media, especially the local newspapers that tend to follow local issues for extended periods and that can have a major influence on the acceptability of seismic rehabilitation programs. This takes skill and preparation, but the evidence is clear that newspaper support is very important and that newspaper opposition can prove fatal. Skillful work with the media may even prevent seismic rehabilitation from becoming a "hot" issue.

Determining Occupant Dislocation and Business Interruption

Nature of the Problem: While extensive seismic rehabilitation projects do not always, they can require relocation of building owners, employees, commercial tenants, and residents. If the construction work is relatively minor but cannot be accomplished with the occupants in place (during off hours when the building is closed), it is better to face this issue as early as possible and allow plenty of time to solve it. If the seismic rehabilitation project involves leased

space and if it is encumbered with a mortgage, loss of rental income to service the debt can become a major concern. It is therefore important to anticipate how potential extra direct costs and inconveniences can be ameliorated in the quest for safer buildings.

Typical Issues: While only some of the impacts are financial, they are the major ones. Typical issues within this context include:

How feasible is it to perform the seismic rehabilitation work without having to relocate the occupants to other locations? This depends a great deal on the building's occupancy and some — even extensive — seismic rehabilitation projects have been completed without relocation.

In addition to the costs of construction, how can the owners continue to pay the mortgage, insurance, taxes, and other operating costs when the building is not generating income? Unless owned outright with costs financed from savings or from a capital improvement pool of the building owner, this "cash flow" question becomes important.

Who is responsible for notifying the tenants and residents, paying the costs of relocation, and allowing sufficient time for the relocation process to occur? These issues are at the heart of the viability of commercial, residential or business occupancies. The answers often depend on the availability of other nearby comparable space, equitable rents, and the use of various subsidies.

Solving the Problem: A variety of actions can be taken to ameliorate these problems including the following:

Ensure that the initial feasibility study of a particular seismic rehabilitation project can address the question of whether the work can be done without substantially disrupting operations. It is much easier in single occupant office buildings or commercial properties that are empty during the late hours and where some internal temporary space-sharing can occur than in multiple tenant or residential occupancies. In addition, the contractor will have to carefully ensure that the construction work areas are sealed adequately and that time is allowed for thorough clean-up before normal business operations resume. One also must be aware of other problems (the existence of asbestos) that could make seismic rehabilitation more complex and expensive.

Cash flow for debt service and operating expenses is critical. Anything, including seismic rehabilitation, that interrupts that flow can have major implications. Nevertheless, the situation will vary with each case. Internal operating or capital improvement monies could be used where they exist and rehabilitation is included in scheduled outlays. As incentives, local governments could suspend property taxes and other charges until the building is ready to be reoccupied. Other types of remodeling and rehabilitation often are done upon transfer of the property to new owners or when major tenants relocate to other facilities. Large tenant commercial leases often last for about five years, and rehabilitation could be scheduled to coincide with a tenant's decision not to renew its lease. Financial advisors to both owners and local governments may well be aware of other possibilities to soften the cash flow impacts of seismic rehabilitation.

The picture is less clear for commercial lessees and residential renters. The minimum is to provide as much advance notice as possible so they can take appropriate steps to minimize the negative impacts. One possible strategy to ameliorate the costs to such occupants could be to help them find temporary and comparably priced nearby space coupled with giving them "first right of refusal" to return to the rehabilitated building. Local governments may be able to offer other incentives through neighborhood revitalization and community redevelopment measures. Such techniques often involve tax, loan, and other incentives, and they can include relocation services assistance.

Minimizing the Social and Economic Impacts on Housing

Nature of the Problem: Although a relative term in any economic setting, "affordable housing" deserves a special focus because of its importance to the community, lower income neighbors, and social justice. Sadly, in many communities it often is the lower income and, just as often, non-English speaking unorganized members that also reside in the more earthquake-vulnerable buildings. When displaced by

damaging earthquakes, these same people also become the most dependent on emergency shelter, financial assistance, and other direct aid. The more affluent find temporary quarters, have other financial resources, and generally are better able to adjust.

Recent research (Comerio, 1995) based on data about the housing losses from the 1994 Northridge earthquake estimates that 60,000 dwelling units could be "significantly damaged" after a major event in the region. Of these 60,000, only 7,000 would be single-family dwellings. Thus, about 53,000 units would be apartment units and about 50 percent would have to be vacated because of the damage. Using 3.5 persons per apartment unit as an average, this means that over 90,000 renters could be homeless. A comparable calculation for an equivalent earthquake on the San Francisco Bay area's Hayward Fault is more depressing because of higher population densities. About 240,000 housing units could be significantly damaged, of which about 100,000 could be unoccupiable. Using the same 3.5 person household average, the homeless could number about 350,000 people (Comerio, personal communication, September 1995). Although less glamorous, technically challenging or financially rewarding than other forms of seismic rehabilitation, the need for effective mitigation measures to protect the nation's housing stock is great.

Typical Issues: While the major issues are comparable to the earlier ones, the main difference is that housing rehabilitation focuses on small economic units (individuals and families). Consequently, it is important to determine:

How long will the project take and where can the occupants go for the duration of the work?

Can the owner afford the rehabilitation work and are there any incentives or cost offsets that can help pay the costs?

If the occupants are renters, will they be able to afford the rent of the rehabilitated housing unit?

If the occupants are in poor health or disabled and have to be relocated, can support be provided in the new locations?

Will the owner demolish the building and put occupants on the street?

Will the owner remove housing units on the site and use the building for something else?

Solving the Problem: Generally speaking, more affluent residents can afford to pay for and vacate their housing during substantial remodeling and rehabilitation. As income declines, however, this easy option disappears. Thus:

Fortunately, even in the smaller (1 to 2 story) single- and multiple-family units, many housing rehabilitation techniques can be employed without requiring occupant relocation. Examples include bolting foundations to sills, tying chimneys to the structure, installing effective shear walls, and applying other sound and well understood techniques. Moreover, such work can be linked to other changes being made to the units. Depending on the scope, such work often lasts only a few days or weeks. However, the seismic rehabilitation of larger buildings, (e.g., apartment buildings) can become complex, costly, and time consuming. Such work is comparable to rehabilitating commercial structures and many of the problems will be the same. Condominiums and other "planned unit developments" create special problems because of the joint maintenance responsibilities for the common areas and governing processes involved in managing such developments.

The affordability of seismic rehabilitation is a function of the financial resources available and that depends to a great extent on whether or not the building is owner-occupied. While desirable, there are very few financial incentives available to housing owners to stimulate seismic rehabilitation. This remains one of the major challenges to speeding up the process. Some aids do exist. For example, California law prevents the raising of property taxes when seismic safety improvements are made to buildings so at least the owner is not penalized by a tax increase. The popular equity lines of credit can be used for home improvements and the interest is tax deductible. Savings also can be used.

Increased rents often are a result of building rehabilitation. Covering the costs of rehabilitation and attracting a more affluent clientele are frequently interwoven motives along with a desire to increase the market value of the structure. This creates special problems for lower income renters. Some techniques for minimizing the impact of higher rents include:

local officials giving higher priority to people displaced by seismic rehabilitation and qualifying them for rental assistance programs; increasing other cost offsets such as providing renters with free or reduced- cost public transportation vouchers and other benefits; and allowing the adjustment of rents within specified time and monetary limits. Nevertheless, the fundamental tension will continue between achieving a safer building (a public good) and controlling the cost of living (a private matter). The extent to which seismic rehabilitation can be directly or indirectly subsidized can greatly affect the continued availability of affordable housing.

Historic Properties Destined for Seismic Rehabilitation

Nature of the Problem: During the past 20 or so years, efforts have been mounted to identify, preserve, and tightly control the uses of and modifications to properties considered "historical." Seismic rehabilitation work on buildings falling into this category can be very challenging for the design and construction community because of special regulations, the existence of delicate finishes and archaic (and often mixed) materials, aesthetic needs, and little or no information about the site, foundation or structural conditions of the structure. Whenever historic buildings are involved, it is very important to carefully review governing codes, standards, and other applicable materials such as the Secretary of the Interior's *Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings* (see Chapter 6).

One structural engineer experienced in the seismic rehabilitation of older and historic structures noted that (FEMA 237, p. 77): "All of these [archaic] systems were designed prior to the development of seismic standards for buildings. Probably none were designed for seismic performance at all." However, because such buildings are intended to be "permanent" fixtures of the built environment, they merit seismic rehabilitation. Nonetheless, ". . . in any community the presence of even a few historic buildings will greatly complicate the implementation of either voluntary or mandatory seismic protection policies for existing buildings" and the ". . . effort to extensively strengthen the building can tend to result in the removal of much of the original material, the obscuring of original features, or the introduction of visible bracing elements. . . ."

On the other hand, the Preservation Tax Incentives for Historic Buildings have provided the means for rehabilitating many buildings. The initiative allows a 20 percent investment tax credit (ITC) for the certified rehabilitation of an income-producing, depreciable certified historic building and a 10 percent ITC for the rehabilitation of income-producing, depreciable buildings (excluding residential rental) built before 1936. Seldom does the seismic rehabilitation cost more than the 20 percent ITC.

Typical Issues: From our perspective, a number of issues related to the seismic rehabilitation of historic buildings are important including:

What is an historic building? To quote from an earlier FEMA document (FEMA 237, p. 79):

> . . . there is no indisputable definition of "historic building." Guidance is provided on rehabilitation of historic buildings in state documents such as the State Historic Building Code in California or in federal documents such as the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Building and associated guidance. Buildings may be listed on the National Register of Historic Places, a state historic register, or a local listing that has official status. In some cases, rather than a simple determination that a building is on or off such a list, a ranking of the degree to which a building is historic is made with reference to a local priority or historic value scale. Criteria and the process for placing buildings on such lists vary and can be influenced by local demands that include considerations beyond this historic quality of an individual building, such as desires to minimize density and land use changes or to avoid renovation or new construction that would introduce higher rents.

Chapter 1 of the *Guidelines* volume, however, states that:

> It must be determined early in the process whether a building is "historic." A building is historic if it is at least 50 years old and is listed or potentially eligible for the National Register of Historic Places and/or a state or local register as an individual structure or as a contributing structure in a district. Structures less than 50 years old may also be historic if they possess exceptional significance. For

historic buildings, develop and evaluate alternative solutions as to their effect on the loss of historic character and fabric, using the Secretary of the Interior's *Standards for Rehabilitation.*

Who has jurisdiction of the building? This seemingly simple issue is a very important one for owners of historic buildings that are candidates for seismic rehabilitation. One needs to determine who actually owns the building (e.g., private party, charitable or nonprofit organization, foundation, or government agency). It also is important to determine who has jurisdiction over the building (local, state, or federal government) and, consequently, which codes or regulations will apply to the rehabilitation project. For example, the city of Seattle has jurisdiction over every publicly or privately owned building except those that belong to the federal government. While not all states may have a state historical building code, the city of Seattle enforces the State of Washington code. Moreover, the owner and his/her design professionals may have to observe other requirements depending upon which category or register the historic building appears is listed on. This specialized field requires specialized expertise.

What is the occupancy and the amount of operational disruption that can be accepted during construction? Some historic buildings, like George Washington's home in Mount Vernon, are landmarks open to visitors while others, such as California's restored State Capitol, function as full-time office buildings and house key activities and records. At the local level, some historic buildings are in older commercial areas of once small towns and their activities are important to the economy of the area and the businesses or residents housed there. In these cases, the amount of disruption, the need for relocation, the nearby availability of affordable alternative space, and the scheduling of the work become important considerations.

What level of performance is desired and how much will it cost? While key questions for all buildings, they are especially important for historic structures because the answers tie back to the building's importance, replacement cost (if it can be replaced at all), the objective earthquake risk, acceptable levels of damage, types of historic finishes, and sources of funding.

Solving the Problem: Dealing with the unique problems posed by historic building rehabilitation can take several forms, alone or in combination depending on the circumstances. Owners sometimes have relatively little to say about what can be done to their designated historic buildings. Therefore, suggested strategies include:

Determine if the particular building has indeed been designated historic and by whom. This information will determine whose design and construction regulations and enforcement processes will govern the project.

Review the regulations and processes, paying particular attention to any special standards or exemptions, design review requirements, appeals or approval processes, flexibility in time for compliance, alternative approaches, and similar factors.

Like other buildings, determine the current use of the historic structure and what the dislocation and other extra needs might be to accommodate the occupants and functions. This will require some effort if these problems can be handled imaginatively, easily, in a timely fashion, and affordably.

Analyze the exposure of the building to the expected earthquake risk in the region and balance this with the building's value to the community. There is the need to judge the building's long-term significance, its occupancy and function, the cost to replace it versus the cost to repair it occasionally, and other factors. The answer will almost never be clear. Given the desired permanence of historic buildings, it may mean that the rehabilitation decision will have to consider lower probability but more severe ground motions and more earthquake occurrences during its estimated post-rehabilitated lifetime.

Select the desired seismic rehabilitation performance level from the Guidelines. As with other buildings, this is critical because the selection will drive the design alternatives, costs, and scheduling. FEMA 237 (p. 80) notes that such an ". . . approach will help preserve historic buildings from earthquakes, even if they are strengthened only up to a minimum life-safety level, and prevent the situation from developing where the historic buildings will be the most hazardous in a community."

Determine what efforts are needed to accommodate the relocation of the occupants, time needed for rehabilitation, and how and if the most important functions performed in the building can be or need to be maintained. Solutions to these issues will vary with each project.

Involve and, to the extent possible, obtain consensus among the controlling stakeholders that the preferred seismic rehabilitation technique will be effective and workable. Historic buildings are highly visible and the foci of often influential advocacy groups. Therefore, it is important that advocates be informed of the potential project and be brought into the process early; it is worth the up-front investment of time and energy.

Obtain the advice of state historic preservation officers and other specialists in the preservation of historic finishes and involve them from the very beginning of the rehabilitation process.

Finding ways to address the unique problems associated with the seismic rehabilitation of historic buildings will help ensure that the threat of earthquake damage to these structures will be reduced and that they will continue to be important reminders of earlier times and events.

Financing Seismic Rehabilitation

Nature of the Problem: While regular building maintenance is a continuing operating cost, seismic rehabilitation and other major capital improvements can be expensive, especially for larger buildings. The ability to finance such improvements varies greatly with the owner's ability to pay, what seismic rehabilitation work needs to be done to the building, and what other improvements will be made at the same time. Since each building has its own story, it is very important to determine if the costs of seismic rehabilitation are affordable. One observer noted that, especially in the eastern United States, most older buildings have expended much of their useful life and frequently may not be providing adequate financial returns in their current condition. Many engineers have submitted reports about what should be done to a building to improve its earthquake performance, only to see little or no subsequent action taken.

It is clear, however, that the pace of seismic rehabilitation is increasing in places like California where frequent recent events have occurred; higher risk is perceived; and lenders and insurers are evaluating properties more closely, limiting coverages, raising deductibles, and taking other measures to lessen their exposure to earthquake losses.

Typical Issues: Successfully answering several questions is at the heart of investing in seismic rehabilitation. Savings, loans, operating revenues, or capital improvement funds are traditional and usually private-sector sources of money to finance seismic rehabilitation. However, some may ask:

Are there government programs available to help pay for seismic rehabilitation?

What incentives exist that at least could help offset the direct costs of seismic rehabilitation?

Can an owner adjust his/her insurance costs to free up funds for seismic rehabilitation?

Solving the Problem: The financing mix necessary to increase the earthquake resistance of existing buildings will vary on a case-by-case basis, but some suggestions can be provided:

If a public agency, the owner can seek direct appropriations through the normal budgetary process. Other possibilities include raising money through the issuance of bonds and other forms of financial participation in public projects. For example, in 1990, California's voters approved Proposition 122, which made $300 million available to strengthen existing buildings owned by state and local governments. Soon after the 1971 San Fernando earthquake, the U.S. Department of Veterans Affairs secured funding through the regular budget process to seismically evaluate and rehabilitate many of its older buildings across the country. As noted earlier, the school district in Clayton, Missouri, raised money via a bond issue and San Leandro used Certificates of Participation.

Limited incentives (mostly indirect) exist and should at least be considered as ways to offset the direct costs of seismic rehabilitation. In 1990, California's voters approved Proposition 127, which exempted seismic rehabilitation improvements to buildings from being reassessed to increase property taxes.

Special funding and tax measures often are part of community redevelopment programs and seismic rehabilitation costs could be considered eligible project costs. State legislation might be needed to expand the definition of "blight" to include hazardous buildings. Bonds might be used to guarantee loans for rehabilitation, but this may be a problem (as it has been in California) because bond holders take precedence over mortgage holders in the event of foreclosure and revenue bonds must be repaid from income generated by the projects they fund.

While mobile homes are not "buildings" in *Guidelines* terms, San Bernardino County, California, is implementing a financial incentive program to seismically strengthen these structures. Learning from the over 7,000 mobile homes damaged in the Northridge earthquake, the county has selected a manufacturer of a foundation bracing system. Owners of existing units must use this approved system to qualify for a low-interest loan program. It is financed by a taxable 7-year bond issue, and the bond buyers receive 10.25 interest. Described as a "win-win" situation, it is "revenue neutral" to the county and participating cities. In addition, low-income mobile home owners also may be eligible for redevelopment funds and other federal and state assistance (CSSC, September 1995)

In the city of Berkeley, 50 of the property transfer fee is waived when a new owner of a house bolts it properly to the foundation. San Leandro, California, waives the need for a building permit and its fees when an owner uses standard guidance provided by the building department to secure his or her home to its foundation. San Francisco's $350 million bond issue (Earthquake Loan Bond Program, November 1992) designates two-thirds of the money ($233.3 million) for the seismic rehabilitation of housing. This means that owners get lower interest rates (about 1.5 below the bank's rates) and better lending terms if the rents are kept affordable. Loans to seismically rehabilitate housing units under this program were costing only about 3 percent in the fall of 1995.

Other types of incentives have been discussed or used in a variety of different contexts. Point-of-sale disclosure requirements and inspections of and repairs to specified conditions or items could be required for residential and commercial properties. Post-disaster aid might be allocated in ways that reward those who invested in seismic rehabilitation rather than those who did not.

Some post-earthquake assistance measures might be adapted to act as pre-earthquake seismic rehabilitation incentives. For example, in addition to waiving permit fees to help recover from the Northridge earthquake, Los Angeles waived sewer connection and business relocation permit fees and extended the payment schedule for business taxes for six months. The city loaned victims hundreds of millions of dollars as "loans of last resort" to help repair damaged housing. Business assistance centers were set up to help small businesses prepare loan applications and supporting business plans. The housing department hired "work out loan specialists" to help design loan packages and solutions and also to become sales people who contacted individual property owners to convince them to apply. Some damaged commercial properties are being taken over by nonprofit organizations, which entitles such organizations to various assistance programs and incentives not available to private owners.

The underlying principle, however, is that the mix of incentives must support the goal of seismic rehabilitation and be consistent with state, local, and private financial laws and practices in the area. The property insurance industry, especially after experiencing major losses in recent years, is becoming more active in the field of mitigation, and seismic rehabilitation is one area of interest. Perhaps this will lead to rate differentials (incentives or disincentives) for at least high value properties where seismic rehabilitation work is accomplished.

Risk managers for some private owners have assumed more of the exposure by changing the mix between premiums, deductibles, and self-insurance reserves, which has sometimes freed cash for seismic rehabilitation. The objectives are not only to protect the physical plant but to lessen the business interruption costs. As premiums and deductibles have increased and property insurance carriers have placed limits on how much they will pay the policyholder, such strategies have become more common. In lieu of paying higher premiums, one approach is to pay for seismic rehabilitation from savings achieved by taking lower coverages and assuming higher deduct-

ibles. Some organizations have even established special reserve accounts to have cash available to make early repairs to damaged buildings. This risk management practice also has been followed by some government agencies whose continued operations are of critical economic importance (e.g., port authorities). While some seismic rehabilitation work can be undertaken with these funds, such special "force accounts" basically provide ready cash for post-earthquake emergency repairs and mitigation actions, even though the entities involved probably will qualify for later federal disaster assistance payments.

PUBLIC POLICY/ADMINISTRATIVE ISSUES IN SEISMIC REHABILITATION

Important policy and administrative issues are inherent in the process when local and state governments exercise their powers and become involved in seismic rehabilitation programs (even though they also may arise occasionally in voluntary efforts). This section focuses on factors that might "trigger" seismic rehabilitation, local capabilities to regulate and perform such work, managing the political issues in program adoption and implementation, addressing common legal problems, choosing which buildings (or how many) to rehabilitate, evaluating the local fiscal effects of rehabilitation, and achieving the mitigation of other hazards while reducing seismic risk.

Triggering Seismic Rehabilitation

Nature of the Problem: Much of the information in the *Guidelines* documents eventually could be used to develop formal seismic rehabilitation codes and standards for use by state and local jurisdictions. Often the rehabilitation of existing buildings requires that permits be obtained, plans be approved, and inspections be conducted. Design professionals and building officials are aware that the extent of a proposed remodel often "triggers" requirements to upgrade the building in many ways. Therefore, one key local policy decision involves determining if and under what circumstances seismic rehabilitation standards or requirements become a required (triggered) part of a more extensive renovation or remodeling project.

Triggers fall into two principal categories — active and passive. Active ones are instigated by building departments and include such things as ordinances requiring the seismic rehabilitation of nonductile concrete frame buildings, the securing of parapets on URM buildings, or the replacement of damaged structural members with those that meet current requirements. Passive triggers are those that come into play when a building owner proposes to make changes to the structure, use or occupancy of the building, when vacant buildings are to be reoccupied (especially when deterioration is evident), and when the owner proposes to sell the building and the transaction is governed by disclosure requirements. Some common triggers are activated if a building:

- Is in a defined class (e.g., URM, pre-1973 tilt-up)?
- Is proposed to undergo major remodeling, (e.g., costing more than a specified amount or 50 percent of its replacement value)?
- Will have a major increase in the number of occupants (e.g., warehouse to offices)?
- Will change uses (e.g., manufacturing to trendy loft-style apartments)?
- Will be changing owners under certain circumstances?
- Is located in a special district (e.g., San Diego's Gaslamp Quarter)?

While triggers are technical matters, they are not discussed in the *Guidelines* documents because their selection is a fundamental policy choice in seismic rehabilitation. Triggers may not specify what the extent of work must be, but they do function as an "off-on" switch.

Typical Issues: Several key questions should be addressed in deciding whether or not to use major remodeling as a trigger for seismic rehabilitation and, if yes, what the specifications should be. Some questions include:

Should triggers be included in a negotiated or formally mandated program at all or should seismic rehabilitation be left to the judgement of the parties

involved? Examples of both approaches exist. A traditional approach is that when the total project cost amounts to 50 percent of the replacement value of the building in question, the local building code requires that other modifications be made or that it meet the requirements for new buildings. This has the advantage of being clear to the parties involved (i.e., the rules of the game are known). While trigger requirements are important parts of the building regulatory environment, experience has shown that projects sometimes are broken down into discrete smaller projects so that triggers and other process requirements are avoided. This incremental approach to rehabilitation may achieve a narrow set of owner-preferred property improvement objectives, but it can miss important public safety objectives. Another approach allows the building official to determine when seismic rehabilitation will be required for a project. When it is, the owner, the involved design professionals, and the building official negotiate the nature and extent of the seismic rehabilitation work on a building-by-building basis.

What should be the rehabilitation standard? Concern is frequently expressed that a rehabilitated building must meet the local code's seismic requirements for new buildings. While it is especially important to increase the capacity of a structure to resist earthquakes, it may not be feasible to require conformance with standards for new buildings for design, cost, practical or political reasons,. Some seismic improvement is better than none.

If seismic rehabilitation is triggered and the project goes forward, should the owner be guaranteed that further and future retroactive requirements will not be demanded for some specified time? Seismic rehabilitation often is expensive. It is important, therefore, that owners be granted some "grandfather" guarantee that further seismic and possibly other upgrades will not be required for some specified (preferably lengthy) period of time.

Will the proposed seismic rehabilitation project trigger other requirements that, when taken together, result in a too complex or expensive project? Typical requirements include hazardous material (asbestos) remediation, access for the disabled, and the installation of fire protection sprinkler systems. While each has an important purpose, it may be possible to establish a seismic rehabilitation program to minimize the triggering of these other requirements. For example, San Francisco's building code regarding the seismic rehabilitation of URM buildings provides owners with an opportunity to obtain an exemption from disabled-access requirements if the work is less than about $86,000 (adjusted for 1996) based on "hardship" or "legal and/or physical constraints"; requests for exemptions are handled by an access appeals board.

Solving the Problem: The key to solving the problem of whether or not to include seismic rehabilitation triggers for major remodeling is directly related to the fundamental policy choice the community makes to achieve seismic safety in existing buildings. If the choice is to formally require seismic rehabilitation, the remodeling program should contain clear statements about the criteria that will trigger seismic rehabilitation requirements. However, if the informal/encouragement approach is used, the local building official has much greater latitude.

If triggers are to be formally prescribed, then choices will have to be made about what they are. In general, a "trigger" reflects a central policy decision for it determines when a building is or is not subject to seismic rehabilitation requirements. The choice of triggers is, therefore, at the crux of the seismic rehabilitation policy formulation and adoption process.

The standards governing existing federal government buildings (ICSSC, RP4, p. 7) specify that a building shall be evaluated and unacceptable risks mitigated when any of the following triggers occur:

- A change in the building's function occurs that results in a significant increase in the building's level of use, importance, or occupancy as determined by the federal agency;
- A project is planned that will significantly extend the building's useful life through alterations or repairs that total more than 50 percent of the replacement value of the facility;
- The building or part of the building has been damaged by fire, wind, earthquake, or other causes to the extent that, in the judgment of the federal agency, structural degradation of the building's vertical or lateral load-carrying systems has occurred;

- The building is deemed by the agency to be an exceptionally high risk to occupants or the public at large; or,
- The building is added to the federal inventory through purchase or donation after the standards were adopted for use by the federal government.

Triggers, however, can be narrowly defined so as to severely limit seismic rehabilitation. A Utah state law that became effective on January 1, 1993, requires that all commercial buildings built before 1975 be evaluated for seismic hazards and that corrective actions be recommended by the evaluating engineer. However, as a state newsletter noted, the law has been largely ineffective because it is triggered only "when said building is undergoing reroofing or alteration of or repair to" parapets and other such limited items (State of Utah, p.5). The difficulty is compounded by building officials being unaware of the change or by owners contracting for reroofing without obtaining a permit.

While less formal than the triggers discussed above, there are other mechanisms ("pseudo-triggers") that can help achieve limited forms of partial or incremental seismic rehabilitation. Studies performed by Building Technology, Inc., (1994, p. 1) on how to improve the seismic safety of existing school buildings in several states focused on linking "incremental seismic retrofit (rehabilitation) opportunities to specific maintenance and capital improvement projects." For example, roofing maintenance and repair could include anchoring of parapets or roof-mounted equipment and shear walls could be strengthened with plywood when finishes are exposed or removed for other reasons.

Assessing Design, Regulatory, and Construction Capabilities

Nature of the Problem: The rehabilitation of existing buildings challenges all involved parties — architects, engineers, other design professionals, local planning and code enforcement officials, the myriad of construction trades, and the owners. The challenges are especially acute for seismic rehabilitation because the requisite knowledge, experience, and capabilities vary widely across the United States. Even in California, where the number of people technically qualified for seismic rehabilitation work is comparatively large, the pool is still quite shallow. Clearly, a successful seismic rehabilitation project depends directly upon the knowledge and experience of those involved. This suggests that anyone initiating or regulating a rehabilitation project with a seismic component should not only carefully evaluate the technical qualifications of those involved but should also be prepared to supplement or require additions to a rehabilitation team.

Typical Issues: To determine if adequate technical, regulatory, and construction experience and knowledge are being applied to a seismic rehabilitation project, several questions must be asked:

From a design and construction perspective, how complicated is the project and is the project team fully qualified to perform the specific work proposed? Although every building has its own story, some types or classes of structure are simpler to rehabilitate than others. Unique or complex structures are especially problematic to rehabilitate, and while substantial documentation and rehabilitation experience exist for some structure classes (e.g., URM bearing wall and tilt-up buildings), considerably less documentation and experience are available to guide the rehabilitation of other kinds of construction.

Whether seismic rehabilitation is just one part of or is the principal reason for a project, the earthquake engineering qualifications and experience of the project team become very important considerations. Ensuring that the proper expertise is applied to the project goes a long way toward effective quality control throughout the process. Careful design is the first part of a rehabilitation process; adherence to that design during the actual work is the second part. Both are important.

When seismic rehabilitation projects are few and far between and when no prescribed guidelines or standards exist, how can the responsible building official be confident that he or she has the technical competence available to ensure that the seismic rehabilitation work is adequately planned and properly performed? Given the unusually high degree of judgment involved in seismic rehabilitation projects, it is

important that the local regulatory agency have knowledgeable and experienced expertise available either on staff or externally.

Where can additional seismic rehabilitation design and construction expertise and capabilities be obtained? The securing of such expertise is a major concern in every project, but it is even more of a problem in areas where comparatively little experience exists and where the practicing architectural, engineering, and construction communities are less well informed about earthquake engineering and seismic rehabilitation. In these situations, local building rehabilitation capabilities must be directly supplemented with specialized earthquake-related knowledge.

Solving the Problem: Many individuals, especially from lower risk seismic zones of the United States who helped design Chapter 5's Applications Scenarios, raised all of the preceding questions. They were clearly concerned about the adequacy of the design, engineering, construction, and regulatory capacities in their locales to successfully perform seismic rehabilitation projects. A few suggestions are offered:

The Guidelines documents provide, for the first time, comprehensive reference information for design professionals to use in strengthening seismically weak buildings. These documents reflect the state of knowledge and practice that existed at the time of publication. While each building has its own story and despite limited experience with the performance of seismically rehabilitated buildings in actual earthquakes, the *Guidelines* documents provide a reasonable basis for undertaking such projects.

Professional societies and trade groups (including local and state architectural and engineering organizations, contractors associations, and builders associations) are often helpful in locating members with seismic rehabilitation experience. Such national organizations as the Earthquake Engineering Research Institute (EERI) in Oakland, California also can help as can such university-based research organizations as the National Center for Earthquake Engineering Research (NCEER) at the State University of New York (Buffalo campus), the Earthquake Engineering Research Center (EERC) at the University of California at Berkeley, and the John A. Blume Earthquake Engineering Center (ERC) Stanford University.

If time allows, an individual can increase his/her expertise by self-study and by attending technical meetings and seminars conducted by a variety of entities. Peer contacts also can be an efficient way of locating appropriate consulting assistance. If sufficient long-term seismic rehabilitation work can be expected, adding expertise directly to the staffs of design, engineering, construction, and regulatory organizations is another possibility. Indeed, for practitioners, adding such expertise might prove a competitive advantage in their market areas.

Depending upon the project and situation, a variety of ad hoc mechanisms such as arranging for independent reviews by other (fully capable) practitioners can be used during seismic rehabilitation projects. Other such mechanisms include forming project-specific panels of expert reviewers and, in the case of regulatory agencies, establishing appeals boards to advise on or even approve seismic rehabilitation projects. The latter mechanism is especially helpful if no formal standards exist or if the project's complexity requires substantial judgment and discussion.

Managing the Program Model's Adoption and Implementation Processes

Nature of the Problem: As noted in Chapter 2, the "Mandatory Program" can be the most controversial to enact and implement, primarily because it requires formal action by such elected bodies as town councils and boards of supervisors or commissioners. By necessity, public policy actions are governed by elaborate and often time-consuming processes and, depending upon the details of the proposed program, high levels of conflict may be generated. Therefore, if seismic rehabilitation is to be achieved through a formal policy adoption and implementation process, several additional issues must be addressed.

Typical Issues: Once it has been decided that a formal seismic rehabilitation program is necessary, a variety of political leadership, technical, process, enforcement, and equity issues must be faced in trying to forge a program that is both effective and acceptable. The questions typically revolve around the choice of a voluntary or mandatory approach, the

standards to be followed, the length of time allowed for compliance (and penalties for noncompliance), the distribution of costs and availability of cost offsets (subsidies, incentives, etc.), and the impacts of dislocation and business interruption.

How can proponents achieve a place for seismic rehabilitation on the often crowded political agendas of governing bodies and can they get favorable action? Issues compete for space on the agendas of key policy-makers and executives, be they corporate boards of directors and chief executive officers or public-sector elected or appointed bodies and administrative managers. Leveraging a place for earthquake safety, especially the subject of rehabilitating potentially hazardous buildings, is a key first step in what is usually a lengthy process. History provides suggestions on how to place seismic rehabilitation on decision-makers' agendas. Earthquakes, at least for a short time, open the well known "windows of opportunity" by creating a change from the context of normal operations. In the aftermath of an earthquake, all of the following heighten awareness, at least for a time: the experience of actual losses and concern about the vulnerability of other properties; the costs of repair, replacement, or relocation; paying the relief and recovery expenses; and the everyday experience of driving home through a disrupted community. In other words, disaster experience usually, but not always, turns what earlier might have been abstract and uncertain notions of threat to concrete appreciations of risk and thereby opens that famous "window." Disaster experience alone, however, may not be sufficient; there have been notable earthquakes that have not resulted in significant actions to reduce future losses.

Sustained leadership clearly plays a major role in achieving seismic safety objectives. For example, as a youngster, Los Angeles City Council member Hal Bernson experienced the 1952 Arvin-Tehachapi earthquakes. Later he was shaken by the 1971 San Fernando earthquake. Representing a major portion of the San Fernando Valley, he adopted seismic safety as an issue when he joined the city council, and he has provided sustained leadership ever since. Although it took a decade (1971-81), Bernson led the way to the enactment of the well known Los Angeles ordinance requiring the rehabilitation of URM bearing-wall buildings. More recently, Councilman Bernson chaired the council's ad hoc Committee on Earthquake Recovery following the 1994 Northridge Earthquake. In the lead capacity, Bernson sponsored and shepherded through to adoption the ordinance requiring the rehabilitation of pre-1976 concrete tilt-up buildings (which were shown to have been a major problem as early as the 1971 earthquake).

Using an incremental approach to solve recognized problems has a long and well documented history in the United States. In fact, it is a common public policy strategy often dictated by budgetary or other practical realities. In the area of nonstructural seismic rehabilitation, there is a relatively recent (1994) example. With the goal of eventually broadening its application, the Silicon Valley Uniform Code Adoption Committee added a new section (3403.6) to the codes administered by all Santa Clara County building departments. As a condition of tenant improvements, this new section states:

> When a permit is issued for alterations or repairs, the existing suspended ceiling system within the area of alteration or repair shall comply with the lateral design requirements of UBC Standard 25-2 Part III because this amendment is necessary to mitigate a known seismic hazard in existing buildings.

At the state level in California, Senator Alfred E. Alquist was a junior member of the Senate in 1969 when a staff member convinced him to adopt seismic safety as an issue, partly because no one else "had it" and partly because the staff member believed that earthquake safety had important statewide implications. Alquist's efforts resulted in the 1970 creation of a powerless, token, legislative study committee, the Joint Committee on Seismic Safety. Nature, coincidence, or luck then took a hand. The February 1971 San Fernando earthquake suddenly highlighted the existence of this legislative study committee (which became immediately recognized and respected) and led directly to many of California's seismic safety policy changes. Included in the innovations and with then-Governor Ronald Reagan's concurrence was the "institutionalization" of seismic safety at the state level via creation of the California Seismic Safety Commission. The fundamental long-term change (bolstered by a series of damaging earthquakes and widely publicized increasing probabili-

ties) has been that seismic safety is now a legitimate and recurring item on the legislature's agenda.

Informal discussions suggest that this pattern of issue-adopting by key leaders exists in private-sector organizations as well. In some cases, the pressure to address the seismic rehabilitation of buildings (and other mitigation and preparedness activities) comes from the home offices of companies with facilities in active seismic areas.

Can local jurisdiction leaders adopt their own program or do they need authorizing legislation from a higher level? This fascinating intergovernmental relations issue is both real and symbolic. It may be that some states, partly because of their statewide building code requirements, would not permit local jurisdictions to adopt retroactive seismic rehabilitation ordinances without authorizing state legislation or without an initiative at the state level to empower local agencies to carry out such programs. In more decentralized states such as California, the cities of Los Angeles, Santa Rosa, and others have the power and took the initiative to enact rehabilitation requirements.

State action may either sanction a desired local initiative or, depending upon political context, provide an acceptable scapegoat for local officials, especially where policy action at the local level is hard to achieve. In the late 1970s, the California legislature, for example, enacted a law protecting design professionals and others involved in seismic rehabilitation from liability under specified conditions, and this facilitated an array of local actions by removing an inhibitor to the professional design community.

In many cases, local officials would prefer that the citizens perceive them as "having to carry out a state requirement" rather than as policy initiators themselves. At the same time, many state legislatures are dominated by suburban and rural members, and seismically hazardous buildings are not problems for their districts. Therefore, unless it is a very urban state, issues like the rehabilitation of buildings often do not receive full attention from state legislators, and it may be difficult to get state action. As one veteran of Utah's early seismic safety efforts noted, the Utah legislature primarily responds to local pressures rather than initiating much itself, especially if the members perceive an issue as infringing on "local control." In this context, a strong consensus among local governments on the desired state action is critical. Again, the situation will determine how to approach the need for facilitating and/or authorizing legislation from higher levels.

Are there ways to accommodate the various interests in the process of program design? Seismically rehabilitating existing buildings, especially if they are occupied, can become complicated because of the temporary — and perhaps permanent — dislocations involved. In moving away from the private voluntary program, in which the owner controls the fate of the occupants, to the mandatory program, where the "we" versus "they" conflicting interests may become paramount, the rehabilitation process should be ready to deal with the range of issues and their advocates. While the specific situation will determine the cast of characters and their positions, they can range from employee groups who pressure for rehabilitation for their own protection (or oppose it because the relocation site may extend their home-to-work journeys) to low-income tenants of single-room occupancy (SRO) buildings whose mobility and options are very limited.

The heart of dealing with the range of potentially involved groups is to deliberately identify the various "stakeholder" interests in the rehabilitation process. A strategy then must be devised to include these group or their representatives, hear their concerns, and accommodate them to the extent possible in the project planning phase. Many local agencies, especially those involved with planning and community development, have extensive experience with citizen involvement and community hearings processes, and this experience can be tapped and adapted for proposed seismic rehabilitation projects.

It may be that some permanent dislocations will be necessary, and these will have to be evaluated on a project-by-project basis. Problems are lessened by the extent to which affordable and available (and often nearby) space is available, relocation assistance is provided, and the opportunity to return to the rehabilitated structure is "guaranteed" or at least offered to the previous occupants. Solving the "various interests" problem may require cooperative efforts between the building owners, real estate agents, property managers, and government officials.

What are the trade-offs between mandatory and voluntary programs? As noted above, this publication is intended to help the reader understand the basic choices available in seismic rehabilitation and the fact that as such projects move from the private voluntary model to the informal/encouragement model and, finally, to the fully mandated program model, levels of conflict and complexity increase. Nevertheless, each model has characteristic advantages and shortcomings. Even though greatly oversimplified, Figure 4 summarizes the "pros and cons" of each model.

Worthy of note is that this is not a linear sequence by any means. Owners may or may not choose to rehabilitate; local and state governments may or may not create formal programs (but they might lend encouragement and indirect support); local code and other administrators might establish threshold standards or criteria that are "triggered" on a case-by-case basis; and the federal government may seismically rehabilitate its buildings regardless of whether or not local jurisdictions do anything about seismic safety.

All rehabilitation costs money and it has to come from someone. The mandatory approach to rehabilitation is the most financially complex of the three largely because government becomes an increasingly important part of the solution and is therefore expected to bring its resources to the table. This expectation is especially high when the scope of seismic rehabilitation encompasses a relatively large number of buildings and prescribes potentially expensive rehabilitation standards.

Owner self-funding of seismic rehabilitation follows traditional paths and is of real concern only to the owner. Self-financing includes renegotiating the mortgage to generate rehabilitation funds, using current income or savings, borrowing on the commercial market, and/or selling additional stock to raise capital (if it is a stock company). Public financial assistance, however, comes in different forms and is constrained by laws and regulations that often prescribe in detail the allowable and legitimate purposes for which public monies may be expended. The underlying doctrine is that while governments can be partners in financing solutions to community problems, they cannot provide a gift of public funds for solely private ends. As is well known in public finance, capital facilities planning and the community development professions, the mixtures of government and private funding become very complicated. In actuality, the financial packages come to resemble—metaphorically—"marble cakes." As government's role increases in seismic rehabilitation so does that "marbelling." The challenge, therefore, is to define the respective roles of the private sector and government in seismic rehabilitation in ways that make it feasible for each to contribute to the goal of providing safer buildings in as affordable a manner as possible. There are both direct and indirect ways to do this, examples of which are discussed below.

In fully mandated programs, government's role as a partial financial partner can be critical. Local officials will have to consider the range of financial assistance they can offer to support the process. Oakland's seismic rehabilitation program for private buildings is stalled because no money is available to help owners with the costs. Meanwhile, the rehabilitation of Oakland's historic City Hall was financed partly by a combination of voter-approved local bond funds and federal disaster assistance monies which flowed from the 1989 Loma Prieta earthquake. San Francisco issued bonds, and San Jose has a redevelopment district in which URM building owners can get assistance in financing their engineering studies and rehabilitation projects.

Government officials have great experience in financing various projects. For example, direct methods include capital funding to provide new or upgraded facilities, issuing bonds to be repaid over several decades, securing matching funds from state and federal sources, and using tax increment financing. Indirectly, government can support the seismic rehabilitation process by working with lenders to create attractive loan programs for community purposes, waiving application and permit fees for projects, and providing transferable development credits. The essential point is that government financial managers and private sector companies must cooperate in seismic rehabilitation programs. In the long run, they could be each other's most important partners.

What are the incentives for compliance and penalties for noncompliance with a program? Incentives and penalties can take many and sometimes surprising forms, and the more formal the seismic rehabilitation

FIGURE 4 Seismic rehabilitation choices—advantages and limitations

VOLUNTARY PROGRAM

ADVANTAGES:

- Clearly reflects policy that owners are ultimately responsible for the performance of their buildings.
- Owner and design and construction team choose project scope, design criteria, timing, and process.
- Limited governmental involvement or control over project, except for normal permitting requirements, but may trigger other requirements.
- Owner assumes all project costs.
- Process is comparatively simple and contains little conflict.
- May help local economy and revitalization of the nearby area.
- May set example for other owners.
- Economic hardships not an issue.

LIMITATIONS:

- May reduce the risk, but not get desired level of earthquake resistance.
- Independent technical review by building departments may be limited by lack of standards and expertise.
- Few buildings are involved, and the pace of seismic rehabilitation can be slow.
- Triggering of other requirements may kill the project.

INFORMAL/ENCOURAGEMENT PROGRAM

ADVANTAGES:

- Symbolizes a practical more flexible commitment than the mandatory approval.
- Based on some form of seismic safety trigger (change of occupancy, percentage or remodeling, cost, etc.)
- Owner assumes responsibility for project-related dislocations and relocations.
- Provides for adherence to a set of common requirements that is based on some level of actual earthquake risk.
- Allows variabilities of each building to be considered.
- Provides for some level of independent design and construction review, assuming the expertise is available.
- Few buildings make this relatively easy to administer on a case by case basis.
- May be part of a local revitalization program that improves local economy.
- While conflict may arise over a given project, widespread mobilization of opposing interests is avoided.
- Costs borne by owners as part of total project costs or may be some sharing with government.
- Completed projects could serve as examples for other owners considering extensive ("triggered") remodeling or rehabilitating projects.

LIMITATIONS:

- May reduce the risk, but not fully address actual risk.
- Case by case approach may be slow and difficult to administer because each project is unique.
- Local officials have no influence over potentially earthquake hazardous buildings unless they are going to be substantially remodeled.
- May result in evictions and lease terminations, resulting in unforeseen community problems.
- Requires fairly sophisticated expertise and assigned responsibilities in building departments.
- Could involve involuntary dislocations and relocations with little due process available to those being displaced.
- Does not represent a shared community commitment to seismic safety.
- May change with rotation of building department personnel.
- May result in owner relocating out of the jurisdiction to one where requirements do not exist.

MANDATORY PROGRAM

ADVANTAGES:

- Symbolizes a political (community-wide) commitment to seismic safety.
- Government and owners may share costs, responsibility for project-related dislocations and relocations.
- Is based on formal policy with specified standards and regulatory processes.
- Each project is independently reviewed and inspected, assuming the expertise is available.
- Results in lower earthquake losses and less demand for response and recovery services and money.
- Assures uniformity of approach and adherence to a formal schedule for all parties resulting in a more predictable process.
- May help revitalize local areas and economy.
- May reduce the risk, but not fully address the actual risk.

LIMITATIONS:

- May create unrealistic earthquake performance expectations among the public and community leaders.
- Is the most difficult to establish politically, and may be feasible only in high risk areas.
- May involve direct or indirect cost sharing by local jurisdictions.
- Depending on scope, can result in significant dislocations, which may be the local governments' responsibility to solve.
- Rather than conform, some owners may abandon the properties, relocate to other jurisdictions without such requirements, or take other avoidance measures.
- May result in evictions and lease terminations, resulting in unforeseen community problems.
- Generates the highest level of conflict as the pool of affected interests is expanded.
- Economic hardship can be very significant.
- May result in higher rent and lease costs, making it even more difficult for lower income tenants and marginal businesses to survive.
- May make it difficult for owners to sell, insure, or qualify for mortgages for nonrehabilitated properties.
- While meeting the formal criteria, but by stimulating the seismic rehabilitation market, can result in questionably competent practitioners and projects.
- May inhibit revitalization by adding costly requirements.

program, the more obvious are the incentives and penalties. However, even in the voluntary and encouraged approaches, important incentives/disincentives exist. The exact mixture depends, of course, upon the approach taken to seismic rehabilitation, but the content and roles of incentives and penalties should be carefully considered in the choice of program type and in the program design phase.

For example, publicizing voluntary rehabilitation may result in increased business and local goodwill (which may be used to achieve other purposes) or it might instill confidence in home office staff and suppliers and customers that a private facility will be capable of operating with a minimum of interruption after an earthquake. In another case, local government can create wealth indirectly by issuing "development credits" for multiple property owners who seismically rehabilitate their buildings. Indirect incentives also may include waiving other requirements (e.g., having to provide off street parking) or allowing the owners to add additional stories to a new building elsewhere. Government also can participate more directly in seismic rehabilitation by investing public funds in street lighting, transportation, landscaping, and other improvements as part of a broader areawide renewal effort; by establishing and guaranteeing discounted interest loan programs to help finance seismic rehabilitation; or by helping find suitable space and paying the direct costs of relocating businesses and residents from structures destined for seismic rehabilitation.

Penalties for not complying with required seismic rehabilitation requirements can be serious, but there is a general reluctance to use them except as a last resort. Most public policy in this specialized field relies on obtaining at least grudging building owner compliance by using realistic standards, providing practical time limits, offering independent appeals processes, and trying to find incentives and subsidies. Nevertheless, the range of potential penalties includes the nonissuance of permits until the plans address seismic rehabilitation requirements, condemnation and removal of the structure under the special provisions of "dangerous buildings" ordinances, issuance of court orders, and adding tax and other lien-type penalties to nonconforming properties. Interestingly, not all penalties have to be governmental. As conditions of a loan, some banks are requiring risk analyses and earthquake insurance coverage that directly affect an owner's decision about buildings known to be earthquake-vulnerable.

How will the community benefit from seismic rehabilitation in the long run, and how can the short run dislocations of businesses and residents be ameliorated? The issue of long-term gain versus short-term pain pervades virtually all community renewal, revitalization, redevelopment, and restoration measures, not just seismic rehabilitation. The governmental process is the proper place to negotiate a balance between the short-term dislocations and longer-term benefits to the community. When seismic rehabilitation of buildings is made a component of larger processes or programs, it is much more likely to be successful.

Los Angeles, for example, paid close attention to the costs of its measures and established two increments of rehabilitation. The first step required — in a short time — the anchoring of the URM bearing walls to the floors and roof structures of the affected buildings, a comparatively inexpensive task that often could be accomplished without dislocating the occupants. The second step involved more extensive and expensive bracing and other measures but allowed installation over a longer time. Interestingly, the ordinance specified that owners who failed to meet the initial anchoring requirements had to meet the second set of requirements in less time than those who had complied, thereby providing a kind of incentive to move quickly on step one's basic anchoring.

Managing the Legal Issues of Seismic Rehabilitation

Nature of the Problem: The very nature of seismic rehabilitation focuses on modifying existing buildings — those built earlier and under different rules. Therein lay the potential legal problems that tend to cluster around the following:

- Potential liability,
- Building owners' rights to due process,
- Disclosure of known hazards,
- The taking of private property and unwarranted exercises of governmental police powers,

- Actions related to absentee landowners,
- The right of government to enact requirements above those sufficient to protect life,
- Gifting of public funds,
- Foreclosure proceedings,
- Negligence,
- Sovereign immunity,
- Foreseeability and unreasonableness of risk versus providing protection,
- Interpretations of "acts of God,"
- Discovery and statutes of repose,
- Causation and concurrent causation,
- Reasonableness of costs to carry out mandates, and
- Status of regulatory codes, design procedures, and similar materials and their use or enforcement as a standard of practice.

There are precedents for responding to a number of these issues, but the fundamental principle is to take only those actions that can be defended within existing state law or local ordinances. It is an axiom of America, however, that anyone has the right to sue anyone (despite some immunities); therefore, legal challenges to seismic rehabilitation should be expected.

Some working definitions are probably in order. In general, a "building code" is formally adopted legislation establishing standards and procedures that regulate the design, construction, alteration, and similar activities related to new and existing buildings. As such, codes are the "law of the land" in the adopting jurisdictions. "Guidelines," by contrast, serve multiple purposes, some of which may have legal implications. They provide users with peer-developed information about dealing with specific issues, in this case the seismic rehabilitation of existing buildings. In this capacity, guidelines serve to help educate users, provide them with a basis for taking appropriate actions, and serve as a common reference. To the extent that guidelines are widely and easily available, they can be used to assess a design professional's knowledge of the state of the art in the field. Moreover, while the specific guidelines considered here, the *NEHRP Guidelines for the Seismic Rehabilitation of Buildings*, were not prepared to be a "model code," it would not be difficult for code-writing organizations and building officials to adapt them for such use. For example, the *Guidelines* would become a *de facto* code if a building official used them to accept or approve a proposed seismic rehabilitation project, especially if the proposer deviated from them without sound justification.

A "standard of practice" is more difficult to define because its use as its determination requires extensive judgment and information. In general, a standard of practice is a yardstick against which to measure or compare a practice or action. Everything else being equal, a user is expected in like circumstances to provide a standard of practice comparable to his/her peers.

However, throughout these legal discussions is the fundamental "reasonable person" principle. For example, judgments would be made on what a "reasonable person" would do or be expected to do under the following illustrative circumstances: the apparent probability that the harm-causing event will occur, whether the person involved actually knew or should have known the risk, the magnitude of the expected resulting harm, and the effort required to institute proper precautions.

Typical Issues: Legal challenges to seismic rehabilitation programs tend to revolve around several specific issues.

Can the local jurisdiction adopt and enforce regulations that require owners to rehabilitate their buildings when these very same buildings met whatever standards were in force at the time of their construction? This question goes to the heart of seismic rehabilitation as an issue of private cost versus public benefit. Moreover, in many cases, the state must be the adopting jurisdiction for any code.

Can the jurisdiction adopt building standards for existing buildings that are less stringent than those in force for new buildings? A positive answer im-

plies a dual level of safety — people in newer buildings are safer than those in older buildings. While perfect safety is impossible to achieve, some types of older building perform better in earthquakes than others and, given the state of knowledge and practice of earthquake-resistant design, every earthquake teaches new lessons (witness the "steel frame buildings problem" after the 1994 Northridge earthquake). Ample justification can be adduced to require existing buildings to be strengthened for the common good. Comparable examples include requiring the retroactive installation of fire sprinkler systems, fire-resistant doors, and fire escapes.

What is the liability of design professionals and contractors performing seismic rehabilitation work that does not (and often cannot) meet the requirements of the current code in force for new buildings? Building codes sometimes contain triggers that may require a building to be brought up to current codes for new construction. Changes in materials, technology, design philosophy, construction methods, and a host of other factors may make it nearly impossible to both practically and economically upgrade a building to current standards. Historic buildings are even more of a challenge, but work on them is often governed by special codes and standards.

What happens if the rehabilitated building is damaged or causes death and injury in a future earthquake? This question anticipates that rehabilitation may prove at least partially ineffective, so great care must be taken to clarify the program objective as being to reduce -- not eliminate -- the potential loss of life and injury in an earthquake. Thus, if a rehabilitated building suffers less damage in an earthquake than it would have before being strengthened, even though it might be a total economic loss, it could be judged to have performed adequately. Moreover, the effectiveness of the rehabilitation most likely will be greater in smaller and perhaps more frequent earthquakes than in the very rare great event where the rehabilitated building could suffer serious damage but probably still less than it would have without any strengthening.

A study (*Life Safety and Economic and Liability Risks Associated with Strengthened Unreinforced Masonry Buildings*) completed in 1994 by the J. H. Wiggins Company is worth quoting in part for it provides particularly useful insights into real legal issues — at least in the California context — that arose following the 1989 Loma Prieta earthquake (pp. 124-130):

> Lawsuits that were filed in the aftermath of the Loma Prieta earthquake established that building owners and design professionals will be held accountable for damages and injuries as a result of structural failures during an earthquake. . . . The key to these large settlements was the fact that the owners could not rebut the abundance of notice they had concerning their buildings' structural defects and their failure to take remedial steps to mitigate the hazards presented by the buildings. . . After Loma Prieta, all UMB owners will be held liable for failing to take corrective measures to mitigate their buildings' hazardous condition. In addition, the owners' design professionals who have reviewed these buildings may be brought into lawsuits, both as defendants and percipient witnesses. . . . Litigation after the Loma Prieta earthquake demonstrated that jurors clearly understand that, under California law, codes are merely a minimum standard. Thus, actual jury reaction has demonstrated that mere code compliance will not be a sufficient defense to protect a property owner from liability. . . . Building owners who have delayed taking action to mitigate the hazards presented by their building's lack of seismic resistance may be faced with a claim of punitive damages if the building causes injuries in an earthquake. An injured occupant or passerby may contend that the owner had knowledge of his building's hazardous condition and was therefore guilty of willful and conscious disregard for the rights and safety of others. . . . To avoid claims of malpractice, design professionals must ensure that their work is done in accordance with the standards of the community in which they practice....Therefore, if a design professional such as an architect or engineer designs a retrofit (rehabilitation) plan using a lower level of safety (such as is contained in many local ordinances), the design professional could ultimately face a claim of liability for malpractice on the grounds that they employed a lower standard than that used in their community.

Solving the Problem: State laws and local ordinances plus precedent-setting decisions from elsewhere define how the legal issues related to seismic rehabilitation can be addressed in any given situation or locality. The key to minimizing legal problems and potentially lengthy delays in implementing seismic rehabilitation programs is to include legal counsel from the very outset.

Counsel will be heavily involved in preparing seismic rehabilitation ordinance language; explaining its provisions within the context of existing law; defending its principles and procedures throughout the policy formulation, adoption, and implementation phases of the seismic rehabilitation program; and answering any challenges that arise.

State and local governments can adopt ordinances and programs that require improvements to existing buildings for reasons of public safety. In general, the courts and legislatures understand that changes in technology, materials, and social needs (e.g., energy conservation and providing access for handicapped people) are legitimate public concerns and that building owners can be required under specified conditions to modify their structures accordingly.

The reality is that not everyone is equally safe. While it is important to narrow the gap, practical technical, political, and economic reasons can be offered for not requiring existing buildings to meet all of the requirements for new buildings. Clearly, the precedent has been set for state and local governments to adopt and enforce less-than-current-code requirements for existing buildings. *Uniform Code for Building Conservation* is a good example as are the court-tested seismic rehabilitation ordinances of Los Angeles and other communities. For a seismic rehabilitation program to be defensible, it must be demonstrated is that the requirements are for public benefit; are reasonable; are uniformly and fairly applied; and include provisions for exceptions, delays, or the use of equivalent alternative measures.

Design professionals and contractors worry a great deal about being held liable for the performance of buildings (and often pay high premiums for errors and omissions insurance). A concern of some design professionals is whether or not they are exposed to liability or criminal charges if a seismically rehabilitated building does not meet the current code's requirements for new construction. Most believe it is commendable to improve a building, and thereby increase safety even though they could not bring it up to the current code governing new construction. In general, however, the best defense is due diligence, adherence to requirements, a practical standard of care, and a test of reasonableness. These seem to be the issues around which most building-related controversies arise.

As noted earlier, partly to help remove this barrier, California enacted SB 445 which relieved local governments and design and construction personnel from liability when doing seismic rehabilitation work under less stringent standards than those required for new buildings. However, this immunity was not extended to cases where negligence or other unreasonable practices were found. Thus, while it is easy to provide general protection, the challenges will be on a case-by-case basis.

While earthquakes are natural events, it is human-designed and -built structures that cause the casualties and property losses. If losses are experienced in seismically rehabilitated buildings as they very well may be, it will be important to show that the project adhered to the requirements and that the work was properly performed. For example, seismically strengthened URM buildings in Los Angeles sustained damage in the Northridge earthquake and, even though the event fortuitously occurred early in the morning on a holiday, it is clear that in most cases the strengthening measures prevented more serious losses of life and injuries. In other words, they achieved the life-safety objectives of the program.

The bibliography in Chapter 6 includes some legal references directly related to seismic safety and building rehabilitation that will help the reader understand the general nature of the issues and determine when legal counsel should be consulted. The context of the particular policy decision or project will greatly determine the applicable legal issues and strategies for dealing with them.

CHOOSING THE TARGETS: SINGLE BUILDINGS, NEIGHBORHOODS, OR CLASSES OF BUILDINGS

Nature of the Problem: A strategic question that must always be answered when structuring a seismic rehabilitation program involves how narrow or broad will the scope be. The answer has significant implications for the policies and actions required, the standards to be applied, the availability of the skills needed, and other factors. Individual buildings can be dealt with on case-by-case basis, but prescribing seismic rehabilitation efforts for areas of town (e.g., Pioneer Square in Seattle), for specific types of building, (e.g., pre-1976 tilt-up wall structures in Los Angeles), or for specific occupancies (e.g., theaters or apartment buildings) is central to defining the rehabilitation program's objective, methods, and processes. The scope decision also will define the community interests that are affected by the decision (e.g., the local "apartment owners and managers association" if rehabilitating apartment buildings is to be the objective).

Typical Issues: Several issues should be considered in choosing the focus of a seismic rehabilitation program. In fact, one should expect that, for a variety of local reasons, the focus of the final seismic rehabilitation program may change during the program design and adoption phases. For example, early and powerful opposition from theater and apartment building owners and church leaders to an early version of the Los Angeles URM seismic rehabilitation ordinance (which attempted to focus on high-occupancy uses) actually caused proponents to broaden the scope to all URM buildings because the apartment, theater, and church representatives complained about being "singled out" unfairly. It also matters greatly if the program focuses solely on government buildings or affects the private sector as well.

In Salt Lake City, in addition to wanting to preserve the important and historic City and County Administration Building by renovating and seismically strengthening it (including a new seismic isolation foundation system), city officials hoped that the public project would provide an example to private owners of responsible actions taken on potentially hazardous buildings. The Church of the Latter Day Saints contributed to this process by voluntarily seismically strengthening the former Hotel Utah, now used as a church office building. Questions that most likely will arise include the following.

Are we going to focus on classes or types of buildings, or specific uses or occupancies or on one or more geographic areas? While every building is unique, cities differ as well. The amply documented poor earthquake performance of URM structures combined with a post-1971 political opening in Los Angeles yielded the Division 88 seismic rehabilitation program focusing on that particular type of structure. Following the 1994 Northridge earthquake, the same approach was taken in the ordinance requiring that seismic improvements be made to early tilt-up concrete wall buildings (buildings whose poor performance had first been documented in the 1971 San Fernando earthquake). Since the Northridge event, the city of Los Angeles has been voluntarily strengthening several of its fire stations, providing an example of a use focus. Following its damaging 1969 earthquakes, Santa Rosa, California, partly because it already had a bounded redevelopment project area, city passed a local ordinance that required the evaluation and strengthening of several types of buildings in the older downtown area. Therefore, Santa Rosa adopted a program based on a geographic scope.

What is the inventory of the targeted buildings (e.g., what is the number of building potentially involved)? This is both a technical and strategic/political question. Collecting building inventory information can consume time and money. It may come as a surprise, but most building departments and other city agencies have not conducted a census of the community building stock. An exception was the city of Los Angeles, where officials were fortunate to have had a good census of its URM buildings because decades earlier the city had enacted an ordinance requiring the strengthening or removal of dangerous parapets and file information on each of the subject buildings was kept. Another exception was Santa Rosa, California, which had an accurate inventory of the buildings in the downtown redevelopment area because of the need to examine various occupancies and uses during the planning process.

Buildings can be structurally tricky and, at some point, the specific characteristics of a building must be determined before seismic rehabilitation plans can be prepared. Since the earthquake resistance of a building depends largely on its frame (which is hidden from view) and because drawings usually are not available (especially for old buildings), real analytical challenges ensue, but the *Guidelines* documents may be of some help in this respect. Facades and earlier renovations may further confuse the issue. Engineers often talk about being surprised — usually negatively — when they move from preliminary "windshield survey" data (to help establish an estimate of the number of buildings of a specific class) to conducting site-specific tests to collect information about particular buildings.

This issue relates directly back to the conflict model. Except for perhaps gaining voter approval for a bond issue to seismically rehabilitate some city building (e.g., fire stations in Salt Lake City or an historic city hall, in Oakland, California), the number of structures is important to understanding the size of the proposed program, the resources needed, and the interests that may be mobilized. It really matters if the scope is a few buildings out of perhaps thousands or 50 percent of a town's commercial downtown area, which was the case in Oroville, California, after its 1975 earthquake. In the Oroville case, the collection of inventory data was easy, but the mobilization of the opposition represented by the Oroville Property Owners Association which was composed of leading members of the town's commercial and political structure, effectively defeated any meaningful seismic rehabilitation program.

Are there any special characteristics of the structures such as designated historical buildings, high density, low-income housing or others? The individual complexity of communities must be accounted for in designing seismic rehabilitation programs. Special considerations must be given, for example, to those buildings that have been designated as historic, and an increasing complication is the designation of local "historic districts" (e.g., as San Diego's Gaslamp District or Claremont California's older commercial area) that often contain the area's oldest structures. In such cases, the advice of specialists in historic preservation is essential early in the definition of any large rehabilitation effort.

The issue of density and the economic characteristics of the residents and businesses are important factors. For example, because of its very high population density, large low income housing stock, cultural identity, political importance and numerous small shops, San Francisco's Chinatown, which consists of the city's many poorly constructed post-1906 earthquake URM buildings, poses an enormous socioeconomic challenge to seismic rehabilitation. On the other hand, the fashionable, upscale, high income, but still densely populated area of Georgetown in Washington, D.C., would pose different socioeconomic and political problems if seismic rehabilitation measures were proposed for that or similar areas.

What does local political experience indicate about which community interests will mobilize around which choice and how will their influence be felt? Throughout this discussion it has been mentioned in passing that seismic rehabilitation programs, which change the rules from when the affected buildings were first constructed, are capable of mobilizing various interests. These interest will vary from community to community, and the challenge is to anticipate which interests will mobilize, what initial positions they might take, and what can be done through incentives, compromise and a perceived fair due process to accommodate their concerns.

Public officials are well aware that hearings, town meetings, and other democratic mechanisms attract more opponents than supporters; therefore, one should not overlook the need to mobilize allies of seismic rehabilitation. Local geologists can help explain the threat, local engineers can help answer technical questions, local construction industry representatives can talk about jobs, local community groups of many different kinds can discuss the positive benefits of revitalization, and other local advocacy groups may be available to help balance the debate. In addition, the local media can be quite influential by thoroughly covering and supporting a proposed seismic rehabilitation program

(e.g., *Los Angeles Times*), reporting but taking no position (e.g., *Oroville Mercury Register*), or paying virtually no attention to the issue (e.g., *Oakland Tribune* following the 1989 Loma Prieta earthquake). Note that "local" is used frequently in this context because there is a common tendency in public forums to discount visiting experts "who don't have to live here." Local champions are better when facing local opponents.

Will seismic rehabilitation be the primary focus or will it be an element of some broader community program (e.g., a comprehensive redevelopment program for a designated area)? There are examples of both strategies: Los Angeles simply moved on seismic rehabilitation of URM buildings; Santa Rosa added seismic rehabilitation to the upgrading requirements for its downtown redevelopment area; and the Clayton, Missouri, school district listed seismic rehabilitation as only one of the many reasons for asking the voters to support a bond issue. In the post-Northridge setting, Los Angeles' Community Redevelopment Agency (CRA) defined several project areas that will include seismic rehabilitation as one element of an overall improvement strategy for the designated areas. Consequently, readers are urged to give careful consideration to evaluating the alternative strategies available to achieve seismic rehabilitation.

OPTIMIZING MULTIHAZARD MITIGATION TO REDUCE RISK

Nature of the Problem: Mitigation is the prevention of future losses. While seismically rehabilitating buildings will help accomplish that goal for earthquakes, buildings also are exposed to such other hazards as river and coastal floods, hurricanes and high winds, fire, and tornadoes. Moreover, because the rehabilitation of existing buildings extends their lives, it increases the probabilities that the buildings will experience the effects of the other hazards. Whenever possible, therefore, it is in the national interest that rehabilitation include measures to better protect the structure from the multiple hazards to which it is exposed over its (rehabilitation-extended) lifetime. Note, however, that overall mitigation becomes complex when one mitigative action such as raising a building for flood protection purposes increases its exposure to earthquake damage if the work done is not properly designed to avoid both threats.

Typical Issues: Several questions should be addressed in a multihazard mitigation context when considering rehabilitation of a building for purposes of seismic protection:

To which other hazards is the site subject? This question is largely one of determining what hazards assessment information exists, where it is located, and whether the quality of the information is adequate for use in a specific rehabilitation project. For example, the City of Seattle negotiates the extent of rehabilitation of an existing building in which the goal is to achieve a balance of life-safety improvements. Along with seismic improvements — which may not be the most urgent need — could be those related to improved exiting, and fire resistance (e.g., the addition of fire sprinklers and alarms).

Are there any governmental, property insurance, or other requirements governing rehabilitation to mitigate future losses? This question can be answered only by checking with the governing (permitting) local jurisdiction or lending or insuring institutions about what, if any, requirements exist. The design team should not overlook the requirements of independently governed special districts such as flood control agencies, fire protection districts, and historic districts. State and federal requirements might exist, and the local jurisdictions often provide information about or referrals to other responsible agencies.

How can we ensure through the project planning and design phase that effective mitigation measures are addressed and that potential conflicts between various corrective measures are resolved? This becomes a key question for the design and construction team.

Are there any financial or other incentives to help achieve multihazard mitigation, and what are the benefits and costs of doing so? The answers to this two-part question relate directly to the cost of the rehabilitation project. On one hand, it needs to be determined if incentives, subsidies, or other measures exist to help offset the costs of hazard miti-

gation. On the other hand, benefit-cost analyses can be done to help determine if the mitigation of existing hazards will, given the probable exposure to future events, be a worthy investment.

Solving the Problem: A fundamental principle to observe in multihazard mitigation is to ensure that the project planning and design process addresses mitigation as part of the rehabilitation project. There may be requirements to do so (e.g., laws requiring the installation of fire sprinkler systems due to substantial changes in the use and occupancy of a building), but others may address hazard mitigation voluntarily as part of their decision to protect their investment, to increase market value, or to provide a rapid return to operations. A few specific suggestions are discussed below.

Obtaining information about the exposure of a given site or building to various hazards is critical to taking effective mitigation measures. Yet, the availability and quality of such information varies greatly from area to area, and it is very difficult to pull all the information from various sources together. For example, flood control agencies have maps showing potential inundation areas under various flood scenarios; city and county planning departments in California often have hazards information as part of their required "Safety Elements"; geography and engineering departments of colleges and universities have their own collections; consultants may have done studies for nearby sites; and state and federal agencies such as the Federal Emergency FEMA and the U.S. Army Corps of Engineers (COE) can be useful providers of hazards information. However, it is the project design team that will have to assimilate and synthesize this information to ensure that it is adequately addressed early in the rehabilitation project planning phase.

While floodplain regulations are the most widely known from a national perspective, many states and localities have specific site preparation and construction requirements designed to reduce the exposure to various threats. In addition, there are sufficient examples to show that property financing and insuring organizations may require attention to hazard mitigation as a condition of their support. For example, a well-known western bank explicitly requires that environmental, asbestos, and earthquake hazards be assessed as a condition of a property loan. The key is to ensure that the question is thoroughly researched by the design team.

Mitigation efforts may disclose apparent conflicts between effective measures to deal with multiple hazards. Cutting holes in structural walls to add fire sprinkler systems may weaken the wall from an earthquake perspective or the pipes may break during an earthquake such as happened to an Oakland, California, building in the 1989 Loma Prieta earthquake because rigid fire sprinkler piping crossed through a seismic separation joint between two parts of what appeared to be, but was not, one building. Consequently, it is very important that the design team identify and resolve in the project planning stage potential conflicts between mitigation measures. This may require expert advice from practitioners in each field and their involvement from the very beginning of the process so that each understands the overall performance objectives and plans. They can then design their elements so as to minimize potential problems. Such coordination can virtually eliminate conflicts between mitigation actions taken for different purposes, especially now that the *Guidelines* documents are available for use in evaluating the seismic aspects of building safety.

Direct and indirect financial incentives may exist to promote multiple hazard mitigation. Their existence, however, is not universal and will have to be determined early in project planning. The small city of Torrance, California, for example, established an assessment district to help finance the seismic rehabilitation of older buildings within the district's boundaries. As noted earlier, state law in California excludes seismic improvements made to buildings from being reassessed for property tax purposes. These concepts could be expanded to include other types of safety-related rehabilitation. Other possibilities include bond funds, property exchanges, and benefits from redevelopment programs.