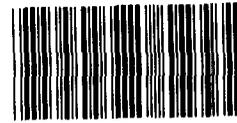


July 1992

EARTHQUAKE RECOVERY

Staffing and Other Improvements Made Following Loma Prieta Earthquake



147348



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**United States
General Accounting Office**

San Francisco Regional Office

**301 Howard Street, Suite 1200
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July 30, 1992

**The Honorable Ronald V. Dellums
The Honorable Norman Y. Mineta
The Honorable Leon E. Panetta
The Honorable Nancy Pelosi
House of Representatives**

In response to your request, this report evaluates selected aspects of the Federal Emergency Management Agency's (FEMA) efforts to assist in the recovery from the Loma Prieta earthquake, which struck the San Francisco Bay area in October 1989. The report assesses the adequacy of FEMA's guidance for determining funding eligibility for damaged facilities and of the agency's strategy for staffing an earthquake recovery effort. The report recommends that FEMA clarify its guidance for funding the restoration of historic structures.

As arranged with your offices, unless you publicly release its contents earlier, we plan no further distribution of this report until 30 days after the date of this letter. At that time, we will send copies of the report to the Director of FEMA, the Governor of California, and the heads of local government units affected by the earthquake.

If you or your staff have any questions about this report, please contact me at (415) 904-2000 or Judy A. England-Joseph, Director of Housing and Community Development Issues, at (202) 275-5525. Other major contributors to this report are listed in appendix I.

**Thomas P. McCormick
Regional Manager**

Executive Summary

Purpose

On October 17, 1989, the Loma Prieta earthquake struck northern California. It was the most destructive earthquake to hit the United States since the Federal Emergency Management Agency (FEMA) was created 10 years earlier to provide disaster assistance. As of April 1992, the agency had obligated over \$350 million in federal funds to repair damaged public and nonprofit buildings and estimated that it would obligate another \$164 million.

More than 2 years after the earthquake, numerous requests for disaster assistance remain unresolved. Disputes over funding have taken place between FEMA and local authorities, primarily over grant eligibility and amounts. At the request of several Members of Congress, who were concerned about the pace of the recovery from the earthquake and the conflicts over funding, GAO assessed the adequacy of FEMA's guidance for determining funding eligibility for public and nonprofit buildings or other facilities and of the agency's strategy for staffing an earthquake recovery effort.

Background

FEMA provides disaster-struck communities with funds to repair, restore, and replace damaged public and nonprofit facilities (such as buildings, pipelines, and piers) under its Public Assistance Program. In the wake of disaster, FEMA staff help local officials to assess the damage to their facilities and submit requests for assistance to a FEMA field office. If the request is approved, FEMA generally pays 75 percent of the cost of repairs. Under its Individual Assistance Program, FEMA also provides funds to assist individuals who have suffered in a disaster.

FEMA responds to many kinds of disasters, including cyclones, volcanic eruptions, floods, fires, and freezes. An earthquake presents special challenges because the damage it causes is often hidden and repairs are often complex. After elaborate tests, structural engineers may disagree on the extent of damage and the repair techniques that should be employed. Thus, recovery from earthquakes may take longer than from other disasters. Moreover, although major earthquakes are infrequent, they are more costly, on average, than other disasters.

In 1988 the Stafford Act amendments (P.L. 100-707) and the implementing regulations expanded FEMA's assistance in several ways. To encourage the adoption of measures to minimize recurring damage in future disasters (known as hazard mitigation), the act included the costs of such measures among the costs to be funded by the agency. After an earthquake, hazard

mitigation may include costly alterations to strengthen buildings against future earthquakes. Implementing regulations further specified that eligible costs could exceed the cost of replacement when historic buildings required restoration. Finally, the act broadened the definition of eligible nonprofit facilities to include those that “provide essential services of a governmental nature to the general public.” Because Loma Prieta was the first major earthquake to occur after the enactment of the Stafford Act amendments, it provided FEMA with its first opportunity to fulfill its expanded responsibilities for this type of disaster.

In a March 1991 report, GAO evaluated other aspects of FEMA’s response to the Loma Prieta earthquake, as well as to Hurricane Hugo, which struck the U.S. Virgin Islands, Puerto Rico, and the Carolinas a month before the earthquake occurred.

Results in Brief

When the earthquake struck, FEMA lacked specific guidance for determining what types of assistance should be provided for eligible buildings. It also lacked a workable staffing strategy for meeting the special challenges posed by a major earthquake.

FEMA officials stated that competing demands, especially an increase in the number of disasters to which they needed to respond, initially prevented them from developing guidance to help resolve a number of eligibility issues stemming from their new responsibilities under the Stafford Act. FEMA lacked specific guidance for determining the eligibility for funding of measures to protect buildings from future earthquakes or to restore historic buildings that could be more economically replaced. It also lacked specific guidance for determining which nonprofit applicants met the expanded definition of eligibility. The lack of specific guidance resulted in many disputes between FEMA and local jurisdictions over the eligibility, scope, and cost of repairs, as well as a reluctance to fund seismic strengthening measures. The disputes led to delays in providing recovery assistance. Recently, FEMA has started developing more specific guidance on protecting buildings from future earthquakes and has proposed more specific regulations for determining which nonprofit applicants are eligible for assistance.

FEMA’s standard approach for staffing a disaster recovery effort is to rely on temporary, rotating staff to perform most of the work. However, this approach did not meet the requirements of a major earthquake. Insufficient training for staff and lack of continuity among staff during the

recovery effort led to disputes and delays. FEMA has taken several steps to help ensure that more stable and better-trained staff will be available for recovering from a future earthquake.

Principal Findings

Clearer Guidance Needed for Determining Funding Eligibility

Mitigating earthquake hazards presents special challenges because measures to strengthen older buildings are often expensive and their costs sometimes exceed the replacement value of the building. In addition, determining appropriate measures is complex and controversial. While awaiting the results of additional analyses of individual structures and operating without specific guidelines that would allow for funding appropriate measures without unduly depleting disaster assistance funds, FEMA deferred decisions on most proposals for protecting buildings from recurring damage. On the basis of information from its own regional offices, as well as from state and local counterparts, FEMA expects to have more specific guidance available by the end of 1992 on funding hazard mitigation measures.

Controversy similarly surrounds proposals to repair historic buildings. FEMA does not have explicit guidance for determining when historic building standards should be followed, and its decisions appeared inconsistent to state and local applicants. Although these officials expected that restoration might be funded in excess of replacement cost, FEMA did not approve the additional expense. For example, FEMA based its contribution to repairing Oakland City Hall on the \$45.8-million replacement cost even though regional officials agreed with Oakland's plans to restore the building according to historic standards at an estimated cost of \$53 million. In contrast, at a nonprofit facility, FEMA based its estimate of the federal share of funding on the \$4-million cost of complying with historic standards even though estimates based on the local building code called for more extensive repairs, costing \$16 million that would have modified the historical appearance of the building. Such apparent inconsistencies resulted in delays and disputes, some of which are still unresolved. FEMA states that it follows historic restoration standards where applicable.

FEMA did not have specific guidelines for implementing the Stafford Act's broadened definition of eligible nonprofit facilities. In addition, a large

number of applications for nonprofit facilities were submitted. For these reasons, regional staff spent 4 months sorting through applications to evaluate eligibility, slowing the pace of assistance overall. FEMA recently published proposed regulations specifying more precisely what types of facilities are eligible for assistance.

Recovery Staffing Strategy Posed Problems

Earthquake repairs involve complex issues that often require months and sometimes years to resolve, such as how best to protect damaged buildings against future earthquakes. FEMA's customary reliance on emergency reserve staff, who usually stayed for a few months, and U.S. Army Corps of Engineers (Corps) staff, who rotated every 30 days, led to discontinuity and inefficiency. Applicants complained that each time a new FEMA representative took over a case, that person had to duplicate previous agency efforts to examine the damage, review the documentation, and learn the complexities. Delays also occurred because Corps staff spent half their rotation periods learning the intricacies of assessing earthquake damage, according to regional FEMA officials. As these problems emerged, regional officials relied more heavily on a technical assistance contractor's staff, who provided continuity and expertise.

FEMA officials noted that Loma Prieta and other disasters at about the same time made unusually great demands on their staff. They said that they have since increased the staff they have available for future recovery efforts, adding more permanent FEMA staff and emergency reservists and gaining greater access to a technical contractor's staff.

Recommendations

To help avoid differing interpretations of FEMA's regulations and to expedite the provision of federal disaster assistance in future earthquakes, GAO recommends that the Director, Federal Emergency Management Agency, clarify the agency's regulations to better specify whether and under what conditions FEMA will pay more than the replacement cost to restore historic structures.

Agency Comments

GAO discussed the factual information in this report with FEMA's Assistant Associate Director for Disaster Assistance Programs and other headquarters and regional officials, and they generally agreed with the information presented. FEMA does not agree that more specific guidance is needed on restoring historic structures. Because differing interpretations

of FEMA's regulations contributed to disputes in recovering from the earthquake, GAO believes that FEMA should clarify its guidance on restoring historic structures in order to minimize possible misunderstandings about the application of the regulations. As requested, GAO did not obtain written comments on a draft of this report.

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Abbreviations

DSR damage survey report
FEMA Federal Emergency Management Agency
GAO General Accounting Office
OMB Office of Management and Budget

Introduction

On October 17, 1989, the Loma Prieta earthquake struck northern California. Measuring 7.1 on the Richter scale, it was the most destructive earthquake to strike the United States since the Federal Emergency Management Agency (FEMA) was created, and it was the first major earthquake to occur since the Robert T. Stafford Act amendments in 1980 expanded FEMA's disaster relief responsibilities. The President declared a major disaster area comprising 10 counties and 2 cities. Severest damage occurred in Alameda, San Francisco, and Santa Cruz counties. The earthquake struck only 1 month after Hurricane Hugo had wrought devastation in the Caribbean and the Carolinas.

Major earthquakes are relatively rare events—accounting for fewer than 1 percent of the disasters that FEMA responds to. However, on average, they make far greater demands on FEMA's budget than other types of disasters

Assistance for Damaged Public Facilities

FEMA was created in 1979 and given responsibility for providing federal assistance to disaster-stricken areas. Under the Robert T. Stafford Disaster Relief and Emergency Act, as amended (42 U.S.C. 5121 *et seq.*), FEMA makes funds available to affected communities for debris removal, emergency work to save lives and protect health and property, and permanent work to repair, restore, and replace damaged public facilities. Private nonprofit facilities are also eligible for assistance under this program. FEMA refers to this program as its Public Assistance Program, as contrasted with its Individual Assistance Program, which aids individuals and families who are victims of a disaster. Money for both programs is held in a Disaster Relief Fund.

The Stafford Act amendments expanded the Public Assistance Program in two ways. First, it authorized assistance for measures to prevent recurring damage in future disasters, known as hazard mitigation measures. Second, it expanded the definition of eligible nonprofit facilities—formerly limited to educational, utility, emergency, medical, and custodial care facilities—to include facilities that provide essential services of a governmental nature to the general public.

In addition, regulations implementing the Stafford Act amendments defined the circumstances under which FEMA would share in restoration costs exceeding the cost of replacing a building with comparable space. Although FEMA's implementing regulations generally limit assistance to the

¹Federal funds for repairing federal highway system bridges and roads are administered separately through the Department of Transportation, which allocated approximately \$388 million for emergency repair of damage from the Loma Prieta earthquake.

less expensive of repairs or replacement, they make an exception for restoring historic buildings "if an applicable standard requires repair in a certain manner."

The federal share of funding under the Public Assistance Program is at least 75 percent; state and/or local governments generally pay the remaining 25 percent. For the Loma Prieta earthquake, the state of California covered the 25-percent nonfederal share except that it capped its assistance to private nonprofit applicants at \$5 million per applicant. The state raised \$776 million for various earthquake relief efforts by assessing a 1/4-cent sales and use tax that was in effect through December 1990. But as of May 1992, the state's Auditor General estimated a shortfall in relief funds of \$648 million for state highways and \$29 million for other purposes.

Once a disaster has been declared, FEMA holds briefings to instruct potential Public Assistance Program applicants in how the program works and what type of paperwork is required. When assistance is requested, FEMA sends out teams to prepare damage survey reports (DSR), describing the extent of damage and estimating repair costs.

The DSRs are reviewed at FEMA's disaster field office. If FEMA and the state approve the DSR, FEMA provides funds to the state. As applicants complete projects and submit costs to the state for reimbursement, the state provides funding to the applicants. An applicant may appeal FEMA's DSR funding decision or request a supplemental DSR if repair costs exceed the approved DSR amount.

Staffing the Public Assistance Program

FEMA had approximately 2,400 permanent staff positions during 1989-91. These staff were responsible for administering civil defense, flood insurance, and other programs. About 10 percent of these staff were assigned to natural disaster response and recovery programs (221 nationwide); these staff were working on 194 disasters as of May 1991. Two percent of the permanent staff (53 nationwide) were assigned to the Public Assistance Program. Of these, five public assistance specialists were assigned to Region IX to administer the program for disasters within that region, which encompasses Arizona, California, Hawaii, Nevada, and U.S. territories in the Pacific.² During the 2 years following the Loma Prieta earthquake, these staff continued working on 25 disasters that occurred

²At the time of the earthquake, Region IX was allocated seven positions for its Public Assistance Program; one position was vacant and one staff person was working on Hurricane Hugo and subsequently did not return to Region IX.

before the earthquake and worked on 11 more disasters that occurred after the earthquake.

The earthquake occurred during a period of increased activity for FEMA. Before 1989 FEMA calculated that 23 disasters were declared in a typical year. In 1989 there were 31 declarations and in 1990 there were 38. The 4 disasters declared in 1991 represented the largest number in FEMA's history; these disasters affected 24 states and 4 U.S. Pacific Ocean jurisdictions.³

When a disaster is declared, FEMA assembles temporary staff to do much the relief work. FEMA's reservists, a major source of temporary staff, are appointed to a 2-year term. Each FEMA regional office maintains a list of reservists and activates as many as are needed to assist in a disaster. Reservists decide whether to respond to a call and for how long they are willing to serve. However, reservists may be dropped from the roster if, after having been called upon for several disasters, they are unavailable for no good reason. FEMA officials consider the reservist program a valuable source of experienced personnel. Many reservists have worked on past disasters and thus are familiar with FEMA's procedures. Some have extensive backgrounds in public works and engineering.

For larger disasters, FEMA may also use U.S. Army Corps of Engineers (Corps) staff or technical assistance contractors. FEMA has a memorandum of understanding with the Corps to provide temporary inspectors. The agency's use of Corps staff has varied from region to region. FEMA has found these staff particularly useful for disasters involving floods, dams, and levees, which fall within their area of expertise.

In June 1991, a task force of representatives from FEMA and the Office of Management and Budget (OMB) reported on a study of FEMA's disaster management activities.⁴ Among other things, the task force recommended an increase in FEMA's permanent staff for disaster relief and a review of the appropriate balance of permanent and temporary staff.

Current Status of the Relief Effort

As of April 1992, 2-1/2 years after the earthquake, FEMA had reviewed more than 9,800 DSRs from 674 public and nonprofit applicants. Of these DSRs, more than 1,200 were for large projects (i.e., projects costing \$36,500 or

³Taking account of the increase in disasters in 1989-91, FEMA reported in early 1992 that the average annual number of disasters had risen to 27.

⁴Joint OMB-FEMA Task Force Report, June 27, 1991.

more).⁵ FEMA had identified about \$686 million in eligible Public Assistance Program costs, of which the federal share was about \$515 million. Of that amount, it had obligated over \$350 million, with another \$164 million remaining to be obligated.

For a typical disaster, FEMA regulations call for completion of Public Assistance Program projects within 18 months. However, as of September 1991, nearly 2 years after the Loma Prieta earthquake, DSRs on about 200 major projects had not yet been finalized. In addition, numerous disputes had arisen between local jurisdictions and FEMA over the scope and cost of eligible repairs: By October 1991, 190 formal appeals had been filed, many more were expected, and other disputed decisions were being reconsidered outside the formal appeals process.

Delays in repairing or replacing damaged facilities have a number of significant effects. Applicants whose damaged facilities cannot be used find their operations hampered by dislocation to temporary quarters. To assist them in continuing operations, FEMA pays continuing relocation costs, including temporary rent. As of October 1991, FEMA had allocated about \$12 million for temporary rent. Because it may take years to repair or replace some of the damaged facilities, this figure will increase over time. Other damaged facilities continue to be used even though they have been weakened and are more likely to fall if another earthquake should occur.

Objectives, Scope, and Methodology

In March 1991, in response to various congressional requests, we issued a report entitled Disaster Assistance: Federal, State, and Local Responses to Natural Disasters Need Improvement (GAO/RCED-91-43). This report focused on problems in disaster preparedness and response, the administration of the Individual Assistance Program, and the coordination of aid among various federal agencies. It covered the effectiveness of federal, state, and local agencies' response to both Hurricane Hugo and the Loma Prieta earthquake.

As time went by, California congressional representatives continued to receive complaints from local jurisdictions concerning the administration of FEMA's Public Assistance Program following the earthquake.

⁵Section 422 of the Stafford Act establishes simplified procedures for smaller projects. If the damage to a facility is estimated to be less than \$35,000 (adjusted annually to reflect changes in the Consumer Price Index), then the federal contribution is based on the estimate rather than on an accounting of actual costs. The adjusted threshold used following the earthquake was \$36,500. It was raised to \$40,200 as of October 1991.

Representatives Ronald Dellums, Norman Mineta, Leon Panetta, and Nancy Pelosi asked us to review FEMA's

- funding policies and decisions that contributed to disputes and delays in providing assistance to local jurisdictions and
- staffing policies and claims-processing procedures that led to problems in submitting claims.

We did not attempt to separate the effects of weaknesses in FEMA's guidance and staffing strategy from the effects of other factors—including the special challenges of recovering from a major earthquake—that also contributed to disputes and delays.

As part of our earlier review, we interviewed officials and collected documentation at FEMA Region IX and headquarters, as well as at various other federal, state, and local agencies, including the California Office of Emergency Services, the Corps of Engineers, the Bay Area Earthquake Preparedness Project (a nonprofit group funded by FEMA and California), and local jurisdictions affected by the earthquake.

For this review, we contacted many of these same offices and agencies for additional or updated information. To discuss local jurisdictions' complaints and observations concerning FEMA's Public Assistance Program, we interviewed local officials in Alameda, San Francisco, and Santa Clara counties. To follow up on issues related to historic preservation, we also contacted officials of the State Historic Preservation Office and the national Advisory Council on Historic Preservation.

We performed our review between April and September 1991, and obtained selected updated information through June 1992, in accordance with generally accepted government auditing standards. We discussed the factual information in this report with FEMA's Assistant Associate Director for Disaster Assistance Programs, Region IX Director, and other headquarters and regional officials. They generally agreed with the information presented. As requested, we did not obtain written comment on a draft of this report.

Lack of Specific Guidelines Led to Disputes and Delays

Before the earthquake struck in October 1989, FEMA had issued interim regulations defining the type of assistance for which public and nonprofit facilities were eligible under the broadened mandate of the Stafford Act. However, it had not issued final regulations or specific guidelines to help its staff interpret them.

Delays and disputes about the extent and type of assistance for which facilities qualified were centered around three issues relating to regulations and guidelines. First, although the act authorized assistance to reduce the vulnerability of damaged structures to future disasters (hazard mitigation), FEMA did not have specific guidelines for determining what measures were cost-justified, and its regional staff said they were reluctant to fund costly strengthening measures. Second, state and local officials told us that FEMA was applying its regulations inconsistently when rules for repairing historic buildings conflicted with local construction codes, and some FEMA officials agreed that these regulations could be clearer. Third, FEMA regional officials said that the guidelines they had received for determining which private nonprofit applicants were eligible for assistance under the act's expanded definition were not specific enough and therefore they had difficulty in making these determinations.

According to the FEMA Director, a shortage of staff devoted to the Public Assistance Program and a massive upsurge in disaster activity prevented FEMA from finalizing its regulations and providing guidelines for determining eligibility. Although interim regulations implementing the act were available at the time of the earthquake, final regulations were not published until 3 months later. As of October 1991, 2 years after the earthquake, FEMA had not provided specific guidelines so as to allow its staff and applicants to clearly interpret the regulations.

Lacking specific guidelines to help implement the regulations, FEMA regional officials told us that they sought to moderate the drain on federal disaster funds, while local applicants sought to maximize assistance. FEMA has yet to reach agreement with applicants concerning how much federal assistance should be provided for many of the largest projects. As of October 1991, FEMA had received 190 appeals of its DSR funding decisions and expected many more as decisions on about 200 major outstanding proposals were made.

Since then, however, FEMA has acted to address two of these difficulties. Cognizant officials told us that FEMA plans to conduct training for certain state officials on hazard mitigation later this year and is studying the

administration of hazard mitigation activities. Also, it has proposed regulations to limit the types of private nonprofit facilities that would qualify for assistance. With respect to the third area—historic restoration—FEMA officials said that they believe the regulations are adequate.

Lack of Guidance for Funding Hazard Mitigation Measures Caused Disputes and Delays

The Stafford Act authorizes assistance for hazard mitigation measures to reduce the vulnerability of damaged structures to future disasters. However, as of September 1991, FEMA had not yet made funding decisions on most major projects for which structural retrofitting might be required by local building codes. Furthermore, FEMA had approved few hazard mitigation measures for less damaged facilities for which structural retrofitting was not required by local codes. Because state and local officials said that they expected more hazard mitigation measures to be funded, disputes arose between FEMA and applicants, which in turn led to delays in providing assistance. FEMA is taking several actions to improve its administration of hazard mitigation funding.

Congress Intended to Encourage Hazard Mitigation

Through the Stafford Act, the Congress intended to help state and local governments prevent future suffering and damage by “encouraging hazard mitigation measures to reduce losses from disasters.” Section 409 mandated that all repairs or construction financed under the act meet applicable safety codes and standards and that appropriate action be taken to mitigate hazards, “including safe land-use and construction practices, in accordance with standards prescribed or approved by the President after adequate consultation with the appropriate elected officials of general purpose local governments.”¹

The act, under section 406, also provided for the first time that FEMA pay 7 percent or more of the costs of hazard mitigation when hazard mitigation is determined by FEMA to be cost-effective. Previously, FEMA had sometimes required applicants to undertake hazard mitigation as a condition of receiving funds for repairs.

¹Section 404 of the Stafford Act also established a hazard mitigation grant program through which additional federal funds (up to 10 percent of the estimated aggregate federal contribution to the Public Assistance Program) are available for hazard mitigation projects in the disaster-affected area. Federal funding under this section is limited to 50 percent of a project’s cost. Between February 1991 and April 1992, FEMA obligated about \$19.6 million for 64 such projects.

In November 1990, P. L. 101-614, section 14(b), further directed FEMA to identify impediments to effective implementation of federal, state, and local programs of earthquake hazard mitigation. According to a FEMA official, the resulting report is expected to be issued in the summer of 1992.

The experience of Loma Prieta demonstrated the importance of hazard mitigation in seismically active areas. Because California state and local governments have taken steps over the years to establish and enforce stringent seismic building codes, most buildings suffered little or no damage and fewer than 70 people were killed (most of them on the highway). When an earthquake of comparable strength hit Armenia—where building codes, seismic mapping, building materials, and construction techniques did not provide as much protection—widespread devastation resulted, and 25,000 people died.

Nevertheless, the potential remains for a more destructive earthquake in California. According to U.S. Geological Survey seismologists, an earthquake measuring 7.5 on the Richter scale could occur on the Hayward Fault, nearer to population centers, and cause more than \$40 billion in damage and up to 4,500 deaths and 135,000 injuries.²

Most of the buildings damaged severely by Loma Prieta were constructed before the stringent construction codes were established. As these buildings are repaired, strengthening measures to bring them up to current earthquake standards, known as seismic retrofitting, could help them withstand future quakes. FEMA officials noted that such retrofitting, however useful, can be very expensive.

Retrofitting Decisions Disputed and Deferred

Many disputes between applicants and FEMA concern whether construction codes and standards for repairing damaged facilities call for seismic retrofitting. These disputes arose because various codes may apply and because it is difficult to determine whether damage is sufficient to require retrofitting. Also, these disputes can have profound cost implications. According to the Region IX Public Assistance Officer, as of May 1991, FEMA was awaiting further engineering and structural studies on most of the 200 major projects that had yet to be approved. According to FEMA headquarters officials, FEMA moved cautiously because making these determinations is complex. However, state and local officials expressed frustration over delays in resolving these cases.

²Seismologists use the Richter scale to measure the amount of ground motion caused by an earthquake. On the basis of seismograph readings of the ground shaking in an earthquake, seismologists assign each earthquake a number to indicate its magnitude. Because the Richter scale is logarithmic, an increase in magnitude of one whole number represents a 10-fold increase in ground motion. Therefore, an earthquake that measures 7.0 on the Richter scale releases about 10 times more energy than an earthquake that measures 6.0.

FEMA and local jurisdictions frequently disagreed on which of several codes and standards should apply to a damaged facility. In many jurisdictions, local codes supplement the state's Uniform Building Code. These codes may require seismic retrofitting if damage to a building exceeds certain thresholds. However, for some buildings, the State Historical Building Code or the Uniform Code for Building Conservation may provide alternate standards, whereby less extensive repairs may be made in order to preserve more of the original structure.

The extent of structural damage from an earthquake is often hidden. After elaborate tests, structural engineers employed by FEMA and applicants sometimes disagreed on how much damage had occurred, whether a given code's damage threshold had been exceeded, and which of various repair techniques, each with its own relative effectiveness and cost, should be employed.

The cost implications of these decisions can be profound. To repair San Francisco's Williams Office Building, for example, FEMA proposed spending \$27,000 to patch the cracks, while the city contended that the building should be retrofitted at a cost of \$5.8 million.³ Similarly, if seismic retrofitting of San Francisco City Hall is required, according to FEMA's Region IX Public Assistance Officer, the costs of repairs could rise from \$11 million to \$80 million or more.

As of May 1991, for most of the projects for which codes may require seismic retrofitting, FEMA had not yet written a DSR or reached agreement with the applicant. Most DSRs that had been written were for patching cracks or other specific repairs rather than for retrofitting an entire structure. FEMA's records do not identify projects whose damage exceeds code's threshold; however, of the 596 large repair projects (costing \$36,500 or more) that FEMA had approved, only 40 involved structural retrofitting. Of the \$65.5 million approved for these 40 projects, \$45.8 million was for one project—Oakland City Hall—and this amount was based on the building's replacement value, not on the cost of retrofitting.⁴

³The Williams Building is owned by the San Francisco Redevelopment Agency, which, before the earthquake, planned to renovate the structure. After the earthquake, the redevelopment agency proposed using FEMA funds to perform a retrofit that would have been part of the renovation.

⁴An additional 14 DSRs were approved to replace damaged structures with new ones. For these 14 DSRs, \$49 million of the \$65.8 million approved was for one facility—the Watsonville Community Hospital.

**Few Hazard Mitigation
Measures Other Than
Retrofitting Were
Approved**

State and local officials told us that because the act encouraged hazard mitigation, they expected to see an increase in the number of hazard mitigation measures that FEMA recommended. Instead, they found that FEMA's inspectors recommended hazard mitigation measures in fewer than 1 percent of the DSRs. As table 2.1 shows, the proportion of DSRs that recommended hazard mitigation measures after Loma Prieta was no greater than the proportion after the Whittier earthquake of 1987, which predated the Stafford Act amendments.

Table 2.1: Comparison of Hazard Mitigation Measures for Whittier and Loma Prieta Earthquakes

	Number of DSRs	Number of DSRs that recommended hazard mitigation measures	Rate
Whittier	1,573	15	1.0%
Loma Prieta	9,136	26	0.3%

Moreover, of the 26 Loma Prieta DSRs for which FEMA's inspectors recommended hazard mitigation, 18 were for small-scale measures, such as bracing library shelves, hot water tanks, and trailers. The remainder were for more extensive measures, such as relocating a fueling facility.

State and local officials attributed the limited number of recommended hazard mitigation measures to the act's change in the way such measures are funded. (As noted previously, the applicant was formerly required to pay for hazard mitigation as a condition of receiving grant funds, but the act required that FEMA pay 75 percent of the cost.) These officials were concerned that if they repaired damage without correcting weaknesses, the damage would recur when the next earthquake struck. Therefore, they frequently appealed FEMA's decisions.

The state and local officials cited the case of the water mains in San Francisco's Marina District as an example of FEMA's reluctance to approve hazard mitigation measures. The 1.7 miles of aging cast-iron piping had broken in over 60 places as the soil moved during the earthquake. The city of San Francisco requested \$937,000 to replace the mains with piping of a more flexible and durable material that would increase the water system's reliability for fighting fires in future disasters. Instead, FEMA approved \$172,000 to repair the breaks in the old lines. After considering additional information submitted in the course of two appeals, FEMA changed its position and agreed, 16 months after the initial approval, to fund the replacement of the water mains.

FEMA regional officials gave two reasons for their reluctance to approve more hazard mitigation measures. First, they were concerned that mitigating earthquake hazards could be costly. Neither the Stafford Act nor FEMA's regulations limit the total federal contribution, nor are there guidelines for how far FEMA should go in providing such assistance. Some suggested that the amount of the federal contribution for hazard mitigation should be based on the total cost of repairing the damage.

Second, regional officials said that it is difficult to determine which mitigation measures are cost-effective because earthquakes are unpredictable in their frequency and severity. Before the earthquake, in March 1989, FEMA issued interim regulations on hazard mitigation. These interim regulations stated that a FEMA regional director could authorize cost-effective hazard mitigation measures.⁵ However, FEMA did not provide its regional staff with any specific guidelines or criteria for use in determining the cost-effectiveness of hazard mitigation measures to help them resolve this uncertainty. When asked why they did not provide such guidelines, FEMA headquarters officials said that the increased level of disaster activity prevented them from doing so for about 2 years after the enactment of the Stafford Act.

Since then, however, FEMA has undertaken several initiatives to improve the administration of hazard mitigation funding. It will conduct training in August for state hazard mitigation officers. Also, it hired a contractor to assess whether its regional offices are consistently implementing hazard mitigation activities. Finally, it distributed a questionnaire to counterpart state and local officials to try to identify how FEMA can clarify its guidance and work toward applying it more consistently. FEMA officials said that they hope these activities will lead, by the end of calendar year 1992, to a prototype model for regional officials to use in considering requests for hazard mitigation assistance.

Historic Restoration Policies Were Disputed

The national Advisory Council on Historic Preservation and California's State Historic Preservation Officer prescribe standards for the preservation of historic buildings. When a building that is on or qualifies for the National Register of Historic Buildings is damaged, the Council must review whether the building should be preserved and, if so, review plans for its restoration. For other damaged buildings of possible historic significance, the state officer may make a similar review.

⁵Federal Register, Vol. 54, No. 53 (Mar. 21, 1989), p. 11637. FEMA issued other interim regulations relating to hazard mitigation activities about 2 months later. See Federal Register, Vol. 54, No. 97 (Mar. 22, 1989), p. 22178.

The Stafford Act provides for the repair, replacement, or restoration of damaged buildings but does not establish criteria for choosing the most appropriate alternative. FEMA's implementing regulations generally limit assistance to the less expensive of repair or replacement. However, these regulations make an exception for restoring historic buildings "if an applicable standard requires repair in a certain manner." In providing assistance for historic buildings after Loma Prieta, FEMA sometimes followed historic preservation standards and sometimes did not, maintaining in the latter instances that the standards were merely advisory.

When the estimated costs of restoring an historic building exceeded the costs of replacing it with comparable space, FEMA limited its assistance to 75 percent of the building's replacement costs. For example, because the Oakland City Hall is listed on the National Register and engineering analysis found that repair and preservation of the structure were feasible, the state officer determined that the building could be restored. Nevertheless, FEMA regional officials calculated federal assistance on the basis of the building's replacement costs, which were \$7.2 million lower than the estimated costs of restoring the building.

FEMA headquarters officials explained that FEMA's policy is to fund the least costly acceptable method of repair but not to pay more to repair a building than it would cost to replace it. They said that in the case of the Oakland City Hall, no applicable standard requires that the building be repaired and if the city prefers to restore the building, it can take the money offered by FEMA and add funds to pay for the restoration.

When historic building standards called for less extensive repairs than state and local building codes, FEMA took the position that the historical standards superseded the building codes. For example, the cost of bringing one private nonprofit building up to code was initially estimated at \$16 million. However, the state officer recommended less extensive repairs, totaling \$4 million, to preserve the building's historical appearance. In this case, FEMA maintained that the less expensive repairs were acceptable and gave precedence to the historical standards.⁶

State and local officials with whom we spoke said that FEMA's funding decisions were inconsistent. According to these officials, FEMA's choice of applicable standards was designed to save federal funds. FEMA regional and

⁶According to a FEMA official, as of June 1992, the building owner's estimate was about \$8 million, while FEMA's estimate was about \$750,000.

headquarters operating officials said that differing interpretations of the regulations led to disputes. However, higher-level FEMA officials maintain that FEMA followed historic preservation standards where applicable and that the regulations are adequate.

Broadened Nonprofit Eligibility Criteria Caused Difficulties

Before the Stafford Act amendments, nonprofit facilities eligible for FEMA assistance were limited to educational, utility, emergency, medical, and custodial care facilities. The act expanded these criteria to include nonprofit facilities that “provide essential services of a governmental nature to the general public.” However, FEMA staff had difficulty in determining eligibility because they lacked specific guidelines and received so many applications for assistance.

Implementing regulations, which were available in interim form when the earthquake struck, gave the following seven examples of essential service of a governmental nature: museums, zoos, community centers, libraries, homeless shelters, senior citizen centers, and shelter workshops.⁷ FEMA supplemented these interim regulations with two memoranda to its regional directors—one before the earthquake, the other afterwards.

The first memorandum, dated August 25, 1989, provided guidance on the key words in the phrase “essential services of a governmental nature to the general public.” The memorandum also suggested that this phrase be interpreted conservatively. The second memorandum, dated April 27, 1990, expanded upon and clarified the earlier memorandum in response to questions that had arisen in applying then-existing policy.

Nevertheless, FEMA regional staff said these memoranda did not provide sufficiently specific guidance for handling nonprofit facilities that did not fit one of the examples. Therefore, the regional staff said that they had difficulty in determining the eligibility of nonprofit facilities beyond those specifically identified in the interim regulations. The responsible regional official said that it took a full-time staff member 4 months to assess the eligibility of the nonprofit facilities for which funds were sought immediately after the earthquake.

Initially, FEMA took a conservative position in interpreting what services were essential and rejected a number of applications. But faced with

⁷These examples are listed in House Report No. 100-517, 100th Congress, 2nd Session, to accompany H.R. 2707 (the bill that became the Stafford Act amendments). Another category—rehabilitation facilities—was included in the House report. However, according to FEMA officials, this category was inadvertently omitted from FEMA’s interim and final regulations.

mounting protests, FEMA changed its approach and ruled that nonprofit facilities were eligible if they provided services to the general public that might have been provided by state or local governments. Approved agencies included musical, theatrical, and recreational organizations.

In the aftermath of Loma Prieta, widely divergent nonprofit organizations applied for assistance. FEMA's revised, and more liberal, approach for determining eligibility encouraged even more organizations to apply. Altogether, during the first 18 months after the earthquake, 391 nonprofit organizations applied for assistance for their facilities.

While the new, more liberal interpretation quieted the disputes, it also increased the workload of FEMA staff who inspected damage and prepared DSRs. The combination of broader eligibility under the act and FEMA's looser interpretation led to approval of 283 of the 391 applicants. According to a FEMA official, the number approved was more than four times the number that would have been eligible before the act (64). The 219 additional applicants increased the cost of assisting private nonprofit agencies by \$8.5 million, from \$50.2 million to \$58.7 million.⁸ Thus, although the damage suffered by many of the newly eligible nonprofit facilities was small, the time and effort that FEMA staff had to devote to processing applications, inspecting damage, and making eligibility decisions was great.

Various FEMA and state officials told us they believed that the new criteria were too broad. A joint OMB-FEMA task force on FEMA's disaster assistance activities recommended in June 1991 that FEMA clarify the eligibility rules for nonprofit facilities. In April 1992, FEMA proposed regulations that would limit eligibility. The proposed regulations would define museums, zoos, and the six other types of facilities enumerated in the House report as the only types of facilities eligible under the Stafford Act rather than treat them as examples.⁹

Conclusions

FEMA's experiences in administering the Stafford Act after the Loma Prieta earthquake demonstrated the need for clear implementing guidance. FEMA

⁸These figures were supplied by FEMA staff in May 1991. They will increase if outstanding DSRs are approved, including, for example, those for Stanford University (eligible before the Stafford Act) and the Geary Theater (eligible under the new criteria).

⁹"Disaster Assistance; Eligibility of Private Nonprofit Facilities," *Federal Register*, Vol. 57, No. 84 (Apr. 30, 1992), pp. 18441 and 18442. The proposed regulations would not affect the types of facilities that were eligible before the Stafford Act amendments, namely, educational, utility, emergency, medical, and custodial care facilities.

**Chapter 2
Lack of Specific Guidelines Led to Disputes
and Delays**

officials acted with responsible concern for the effective use of limited federal funds, but in the absence of specific guidance, their concern led to halting progress in repairing the damage. FEMA is working to provide more specific guidance to its regional officials on hazard mitigation, and FEMA has proposed to limit the types of private nonprofit facilities that are eligible for assistance. However, to minimize delays and disputes following the next major earthquake, FEMA still needs to better define eligibility standards for restoring historic buildings.

Recommendation

To help avoid differing interpretations of FEMA's regulations and to expedite the provision of federal disaster assistance in future earthquakes we recommend that the Director, FEMA, clarify the agency's regulations to better specify whether and under what conditions FEMA will pay more than the replacement cost to restore historic structures.

Staffing and Procedural Problems Hampered Aid

FEMA has few permanent full-time staff to administer disaster assistance and relies on temporary staff to meet the needs created by individual disasters—an approach that it considers suitable for most disasters. However, its reliance on temporary, rotational staff proved inadequate to meet the special challenges of an earthquake as severe as Loma Prieta, especially since Loma Prieta followed Hurricane Hugo by only 1 month. FEMA's staffing strategy resulted in delays and disputes. FEMA has taken several steps to help ensure that an adequate number of trained staff is available to carry out the Public Assistance Program following future major earthquakes.

In addition to staffing problems, procedural problems (such as the use of multiple inspection teams), hasty assignments of inspectors, and underestimates of costs caused delays and disputes. These problems resulted primarily from efforts by FEMA and associated staff to deal promptly and within staffing constraints with the damage caused by the earthquake.

Reliance on Temporary Staff Led to Disputes and Inefficiencies

Relying on temporary staff who frequently turned over proved inadequate for effective administration of the Public Assistance Program following Loma Prieta. The complex, long-term nature of seismic repairs demands continuity and expertise. After Loma Prieta, disruptions occurred and poor-quality work had to be redone because (1) the number of permanent staff was not sufficient to train and supervise temporary staff, (2) the FEMA reservist staff turned over frequently, and (3) the Corps of Engineers inspectors rotated every 30 days. Use of technical assistance contractor personnel, however, helped to provide both continuity and technical expertise.

Staff Continuity Needed for Major Earthquakes

For nonseismic disasters, FEMA officials said they have successfully brought in temporary personnel to conduct inspections, write up DSRS, and then leave. However, such an approach was not effective for Loma Prieta because much of the damage was hidden, complex issues involving building codes often arose, and months or even years could be required to resolve a case. Temporary staff rotated out, to be replaced by other temporary staff. Applicants complained that each time they had to deal with someone new, that person had to start over examining the damage, reviewing the documentation, and learning the complexities of the case.

Such interruptions sometimes had direct monetary effects. For example, delays in reconstructing Oakland City Hall are costing FEMA \$370,000 per month in temporary rent. The FEMA Public Assistance Officer attributed these delays, in part, to a lack of staff continuity, which, he said, prevented him from assigning a staff person continuously to the case. Had he done so, funds could have been obligated in time to save several months' worth of temporary rent payments.

FEMA Had Few Permanent Staff to Oversee Temporary Staff

When the earthquake struck, FEMA had five permanent staff assigned to Region IX to administer the Public Assistance Program for disasters with that region, which includes Arizona, California, Hawaii, Nevada, and U.S. territories in the Pacific. While devoting most of their time to the 9,000-plus Loma Prieta DSRs involving hundreds of millions of dollars, these staff also were responsible for 36 other disasters within the region, including 11 that occurred after the earthquake.¹

In keeping with its standard practice, FEMA therefore relied on four types of temporary staff—FEMA detailees, Army Corps of Engineers personnel, FEMA reservists, and contract engineers—to do much of the Public Assistance Program work for Loma Prieta. Seven permanent FEMA employees were detailed from headquarters or other regions for an average of 3 weeks. In the early months following the quake, FEMA used as many as 117 Corps of Engineers staff at a time as inspectors. These staff rotated every 30 days. Over the 20-month period following the earthquake, FEMA also used 40 reservists, whose median length of stay was 3 months. Only one reservist worked from the beginning of the recovery effort through May 1991. Finally, FEMA used up to 35 contract engineers at a time. Twenty months after the earthquake, FEMA had 12 reservists and 23 contract engineers continuing to assist the 5 permanent staff. Corps and contract inspectors did the bulk of the DSRs (see table 3.1), while the reservists were often used as liaisons between the inspectors and FEMA's permanent staff.

¹Region IX disasters in the 2 years following the earthquake were six typhoons in the Pacific, floods in Arizona, volcanic eruptions in Hawaii, fires in Santa Barbara and Oakland, and a freeze in California.

²Primarily from Barrett Consulting Group, through a subcontract with Dewberry & Davis, FEMA's prime technical assistance contractor.

**Table 3.1: Damage Survey Report
Workload as of April 25, 1991**

Type of staff	Number of DSRs written
Corps of Engineers	3,774
Technical assistance contractor	3,750
FEMA permanent and reservist staff	1,612
Total	9,136

State and local officials said that FEMA provided insufficient training and supervision of the Corps, reservist, and contractor personnel who prepared the DSRs. Errors were made in determining what costs were eligible—for example, reimbursement for the costs of police and fire department staff responding to the disaster was denied. Delays and extra work resulted, as letters and phone calls went back and forth between local, state, Corps, or contractor officials and FEMA officials seeking to resolve these cases. FEMA officials said they lacked sufficient permanent staff to adequately train and supervise the large number of temporary staff used for Loma Prieta.

The OMB-FEMA task force's June 1991 report identified a number of problems in the disaster assistance program generally and in the administration of public assistance specifically and recommended corrective actions. It noted that the Administration had already proposed an increase in resources for the disaster assistance program and recommended a further increase. It also recommended, among other things, that FEMA and OMB review disaster assistance staffing to identify methods for accommodating significant fluctuations in workload and providing an appropriate balance of permanent and temporary staff.

**FEMA Has Difficulty
Retaining Qualified
Reservists**

FEMA officials cited several reasons why more than half of the 40 reservists who were activated to work on the earthquake stayed for about 3 months or less. First, reservists, who decide whether to respond to a call from FEMA and how long they are willing to serve, generally wanted to work only for short periods. Second, some highly qualified reservists left because they found that FEMA's pay rates—about \$18 per hour for most reservists—were not competitive. Third, some reservists were affected by the overtime work and stress involved in disaster assistance work, and some suffered from health problems.³ Finally, all of the reservists used in the Public Assistance Program following the earthquake were retirees, many facing retirement benefit cutbacks if they worked for very long.

³FEMA is working with the National Institute of Mental Health to identify sources of stress affecting disaster assistance employees and ways of reducing such stress.

We did not interview departed reservists, and FEMA does not keep records of their reasons for leaving, so we could not substantiate most of these reasons. However, we did perform an analysis to illustrate the impact of reservists' income on Social Security benefits, as follows. During 1990, under the Social Security Act,⁴ retirees 65 and over earning over \$9,360 and retirees under 65 earning over \$6,840 had their benefits reduced by \$1 for every \$3 earned. At \$18 an hour, a reservist who works 40 hours a week would have gross earnings of \$720 a week. Assuming no other earned income during the year, he or she would reach the \$6,840 threshold in less than 10 weeks and the \$9,360 threshold in 13 weeks. After that point, the earnings offset would apply, and the \$18 hourly wage would effectively become \$12. According to the Region IX Public Assistance Officer, the majority of the reservists involved in the earthquake recovery effort were nearly or more than 65 years old.⁵

The FEMA official in charge of the reservist program nationwide said that it is not reasonable for FEMA to rely heavily on reservists to handle large disasters like Loma Prieta because continuity is important and because FEMA does not have enough permanent staff to provide so many reservists with proper training, oversight, and supervision. For example, one reservist inspector improperly disallowed the cost of repainting an entire cracked wall that was to be repaired because he was following obsolete FEMA guidance. Mistakes of this nature provoked disputes and required rewriting DSRs, thus causing delays.

Corps Inspectors Lacked Training and Continuity

In 1988 FEMA and the Corps of Engineers signed a memorandum of understanding whereby the Corps would make trained personnel available for 30-day periods when needed. For example, before the earthquake, FEMA Region IX had provided several days of training to more than 20 Corps personnel. However, most of these trained Corps personnel were assigned to help with Hurricane Hugo or with the Individual Assistance Program for Loma Prieta, and thus only one was available for the Public Assistance Program.

While most of the trained Corps inspectors were busy elsewhere, FEMA used over 100 Corps personnel with no prior training to make inspections, write DSRs, and manage the DSR process during the first 4 months after the earthquake. Besides lacking training in FEMA's eligibility rules, these Corps

⁴Section 203.

⁵On the nationwide roster, as of June 20, 1991, 34 percent of the reservists were 62 years old or older, while 26 percent were 65 or older.

personnel generally had little experience in estimating the cost of building repairs, according to FEMA and Corps officials.

Also, in accordance with the memorandum of understanding, Corps inspectors rotated out every 30 days. According to FEMA Region IX officials, it took about 2 weeks for Corps personnel to learn their jobs and become productive. Two weeks later, they would leave and be unavailable for follow-up inspections. Because of the inspectors' inexperience, many DSRs later had to be rewritten, leading to delays in delivering assistance. For example, inexperienced Corps inspectors often neglected to adjust cost estimates to account for travel and setup time for small projects.

FEMA regional officials said that if Corps personnel are used in future earthquakes, they should be trained and be available for more than 30 days. Furthermore, they indicated that it was inappropriate for rotating Corps inspectors to prepare DSRs involving extensive repair of earthquake-damaged buildings, for which continuity and construction expertise are essential.

Contract Staff Provided Continuity and Expertise

In February 1990, FEMA stopped using Corps staff and relied increasingly on its technical assistance contractor to handle the DSRs, particularly in complex cases. The contractor provided the continuity of personnel and professional expertise in building repairs that the Corps staff lacked. While contract staff conducted inspections and wrote DSRs, FEMA staff maintained responsibility for reviewing and approving the DSRs and obligating funds. When one major applicant challenged the recommendation of the contractor, FEMA brought in a second, widely respected firm to help resolve the dispute. FEMA officials said that for smaller, simpler disasters, they can rely on reservists, but should another major earthquake occur, they would like to rely more heavily on contract staff.

Although the contract staff provided greater continuity than Corps staff and reservists, state and local officials expressed a concern about FEMA's heavy reliance on contractor personnel. After FEMA turned over management of DSRs to contract staff, these officials complained that contract staff lacked thorough knowledge of FEMA's eligibility rules. To get DSRs corrected, applicants had to appeal to FEMA officials, and assistance was delayed.

**FEMA Has Improved
Earthquake Recovery
Staffing**

FEMA officials acknowledged that their staffing strategy did not provide a many trained staff as would have been desirable for recovering from a major earthquake. They said that a major reason for the shortage of trained staff was the need to deal, within a short span of time, with the earthquake, Hurricane Hugo, and many other disasters.

FEMA officials explained that a number of steps have been taken to provide more trained staff for recovering from a future earthquake. These involve not only an increase in FEMA's own staff but also access to more personnel from outside sources. Each of these steps provides more options for FEMA in responding to a future disaster or combination of disasters.

The Congress provided funding to FEMA for 59 additional staff members, most of them designated for the disaster assistance program. These included five additional staff for Region IX—two for Region IX's San Francisco office and the other three to establish a disaster assistance office in Hawaii, which can help Region IX respond to disasters in the Pacific. Of these five new positions, two (one each in Hawaii and San Francisco) were designated for the Public Assistance Program. In addition, FEMA has increased its reservist force from about 1,800 at the time of Loma Prieta to about 2,300 in June 1992.

Furthermore, FEMA has revised the contract with its technical services contractor, among other things, to make considerably more contract staff available. For example, the previous 3-year contract called for the contractor to provide 4,700 hours annually and stated that the contractor could expect to provide 20 professionals for 1 month. The revised 3-year contract calls for the contractor to provide over 15,000 hours annually and states that the contractor could expect to provide 40 professionals for 2 months and 20 professionals for 6 months. The revised contract also provides that, in the event of a catastrophic event, the contractor may be called on to provide 350,000 hours. (This number of hours is well in excess of the nearly 200,000 hours of contractor time used, as of May 1992, for the Loma Prieta earthquake.)

Finally, FEMA entered into a memorandum of agreement with the Tennessee Valley Authority in December 1991. This agreement provides another group of engineers on whom FEMA can rely during recovery.

**Procedural Problems
Hampered Aid**

Several procedural problems resulted in delays, disputes, and inefficiencies. Use of multiple inspection teams led to overlapping DSRs

and redundant efforts, and hasty scheduling of inspections led to inefficient use of inspectors. FEMA officials told us that they had tried these approaches in an effort to respond quickly to the earthquake's damage but that these approaches were not successful and would not be tried again. In addition, low cost estimates on DSRs resulted in disputes and extra work. FEMA officials said that the problems with the cost estimates have been corrected.

Use of Multiple Teams Led to Problems

Normally, FEMA sends a single team to inspect damage and write DSRs for each damaged facility. But because of the magnitude of the disaster and the number of DSRs involved, FEMA used multiple teams, variously composed of FEMA, Corps of Engineers, contractor, and state personnel, in an effort to expedite reimbursement for debris removal and emergency work. First, a team was sent in soon after the quake to help applicants prepare documentation for the DSRs. Next, an inspection team was sent to write DSRs for debris removal and emergency protective work. Then another inspection team was sent to write DSRs for permanent repairs.

FEMA officials said that this approach did not work and they would not try it again. The first teams arrived while local jurisdictions were still working around the clock responding to emergency needs. Thus, the documentation was not prepared when the inspection teams arrived. The various inspection teams were unable to distinguish clearly between emergency work and permanent repairs. As a result, for many projects, the coverage of the two DSRs overlapped, and FEMA had to go back and rewrite many of the DSRs. Meanwhile, the local applicants complained that dealing with multiple inspection teams—showing them around, answering questions, and providing documentation—caused extra work and further delays.

Hasty Inspection Scheduling Proved Counterproductive

To hurry its response, FEMA dispatched inspectors without waiting for applicants to submit a list of projects with a description of damage, as is the usual practice. Thus, FEMA did not know in advance which projects were complex and needed an inspector who was a highly experienced engineer and which could be handled by less experienced inspectors. As a result, experienced engineers sometimes handled simple cases, and inexperienced inspectors sometimes tried to handle complex ones. On occasion, the inspectors would come back and say that they lacked the expertise to handle certain cases, so a more skilled team would be sent. This attempt to expedite the process proved counterproductive, resulting

in delays and more work for both FEMA and the applicants. FEMA officials told us that they would take steps to avoid this problem in the future.

Low Cost Estimates Resulted in Disputes and Extra Work

Low initial estimates of repair costs on the DSRs resulted in delays, disputes between applicants and FEMA, a proliferation of supplemental DSRs to cover additional costs, and in certain cases a need to rewrite the original DSRs. Several factors led to low estimates. Although FEMA had taken some steps before the earthquake to establish construction cost schedules for various geographic regions, some of the cost schedules—about 25 of 400, according to a regional official—inadequate reflected the high construction costs in the San Francisco Bay area. FEMA officials said that these schedules have been corrected.

Moreover, the cost schedules were based on a certain volume of work. According to FEMA officials, for small projects (for example, repairing on crack) the inspectors were supposed to adjust the estimates to account for travel and setup time. Some inexperienced inspectors omitted this adjustment. Correcting their mistakes led to delays.

FEMA officials said that they also sought to ensure that federal dollars were not misspent. About 87 percent of the DSRs were for less than \$36,500. Under section 422 of the Stafford Act, the federal contribution in such cases is based solely on the DSR estimate rather than on a subsequent accounting of actual costs. In such cases, regional FEMA officials said that they kept the original estimates low and planned to cover any costs above the estimates by supplemental DSRs rather than risk overestimates that would allow applicants to keep excess funds.⁶

Applicants have submitted many requests for supplemental DSRs, and FEMA officials expected many more to come. For example, by March 31, 1991, San Francisco, with 189 initial DSRs, had submitted 209 requests for supplemental DSRs. In many cases, the city requested a supplemental DSR after receiving FEMA's original estimate and then requested a second supplemental DSR some months later after receiving contractor repair bids. As of July 1991, FEMA had approved 980 supplemental DSRs. The additional workload created by the supplemental DSRs slowed the overall pace of assistance.

⁶FEMA headquarters officials stated that they do not encourage regional officials to approach DSRs this way because administrative costs are increased.

The low cost estimates also created an adversarial relationship between applicants and FEMA, according to officials on both sides. After receiving complaints from applicants, FEMA raised some of its cost schedules. FEMA also sought to assure applicants that additional costs could be covered through supplemental DSRs, yet some applicants said that they were unsure whether they would get full reimbursement for repair costs. Indeed, in April 1991, FEMA suspended further Public Assistance Program funding because its funds were depleted. The Congress provided additional funds in December 1991 so that FEMA could resume reimbursing applicants for approved repair costs.⁷

Another consequence of low cost estimates was that DSRs had to be rewritten when applicants chose to apply repair dollars to alternate projects. Section 406(c) of the Stafford Act allows applicants the option of applying 90 percent of the estimated federal share of repair costs to alternate projects or hazard mitigation measures. Stanford University, which had a large number of DSRs, requested this option. FEMA agreed to rewrite the DSRs over \$10,000 in order to more accurately calculate the federal contribution to the alternate projects. Rewriting the DSRs delayed progress.

Conclusions

Because of the magnitude of Loma Prieta and the large number of other disasters that occurred at about the same time, FEMA's standard approach for staffing disasters proved inadequate for Loma Prieta. Lack of continuity and expertise led to delays and disputes. Officials' attempts to deal promptly with the damage led to procedural missteps, which further aggravated the situation. From this experience, FEMA officials learned lessons concerning the staffing and procedures needed for a major earthquake recovery effort. They have taken or are taking a number of steps to help ensure a greater supply of trained staff in the event of another major earthquake. Because of uncertainty about when and where an earthquake may occur and how much damage it may cause, and about what other disasters FEMA staff may need to contend with at the same time, it is hard to know how much staffing will be enough. FEMA's responses, if properly implemented, should help to ensure a prompt and more efficient recovery from a future earthquake.

⁷Funds were provided by P. L. 102-229, December 12, 1991, 105 Stat. 1711. The act is entitled the Direct Emergency Supplemental Appropriations and Transfers for Relief from the Effects of Natural Disasters, for Other Urgent Needs, and for Incremental Costs of "Operation Desert Shield/Desert Storm" Act of 1992.

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