After the Quake: Historic Preservation in Los Angeles

By John Hinrichs

Southern California got an early wake-up call on January 17, 1994, as the most destructive earthquake in the history of Los Angeles struck at 4:31 a.m. The 6.7-magnitude earthquake crushed lives, destroyed highways, turned parking structures into rubble, and brought the contents of buildings crashing to the floor. A 5.9-magnitude aftershock rumbled through the city just a minute after the quake, and millions of people fled into the streets in those predawn hours.

The El Cortez apartment house in Santa Monica just hours after the January 17 earthquake struck. The building, constructed in 1928, was awarded a technical assistance grant and is being repaired. Photo: Nancy Kaye 1994.

The Northridge earthquake was centered in the San Fernando Valley, northwest of downtown Los Angeles. Destruction was not limited to the epicenter, and communities 20 or more miles away experienced severe damage. Fifty-seven people lost their lives, thousands were injured, and thousands more were left homeless.

Remarkably, Southern California museums suffered little damage to collections through all this devastation. Over the past decade, museums have upgraded protection with a variety of techniques, from isolator bases—mechanical devices that can absorb up to 80 percent of ground movement while allowing objects to remain relatively still—to adhesive wax and bubble wrap.

Unfortunately, historic structures throughout Southern California were not as secure. More than five hundred officially designated landmarks and other historically or architecturally significant buildings were damaged, with an estimated repair cost of more than $250 million. Damaged historic structures included the Los Angeles Memorial Coliseum, Los Angeles City Hall, the Andrés Pico Adobe, and the Egyptian Theater in Hollywood.

In the first few days after January 17, several preservation organizations formed a consortium to save threatened buildings. Ultimately named Historic Preservation Partners for Earthquake Response, the group included the Los Angeles Conservancy, the California Office of Historic Preservation, the National Trust for Historic Preservation, and the Getty Conservation Institute.

For most of the Partners, this involvement was an extension of their ongoing efforts in planning for disasters and disaster response. In the mid-1980s, for example, the GCI initiated a series of meetings on disaster preparedness that brought together directors of cultural institutions and disaster experts. These meetings played a part in sensitizing the Federal Emergency Management Agency (FEMA) to the value of cultural property and brought about a shift in fema policy with regard to conservation.

The National Trust has been particularly active in disaster response. "The first time the National Trust really responded to a disaster was Hurricane Hugo in late 1989, and then the Loma Prieta earthquake," says Peter Brink, a vice president with the National Trust. "The key to our quick response this time was the support from the Getty Conservation Institute. They provided key staff people who made the difference."

Within two weeks of the quake, the consortium developed a low-interest loan program with First Interstate Bank of California to offer immediate funds to stabilize historic buildings. Owners of historic properties could borrow up to $20,000, with an interest rate of no higher than 4 percent for the first year. The funds were available for architectural and engineering services and the cost of materials and labor necessary to stabilize buildings.

To encourage property owners to participate, a project manager and program staff, hired with support from the GCI, began coordinating technical assistance teams. Working with property owners, the teams—composed of architects, structural engineers, and preservation specialists—assessed damage to buildings and offered suggestions on how to stabilize and rehabilitate historic structures.

Soon the effort expanded. "The first few days after a disaster strikes are key to setting a tone for preservation," says Linda Dishman, executive director of the Los Angeles Conservancy. In order to respond fully to the earthquake, "it was extremely important to identify the historic structures that were damaged."

The Ara's Pastry building, located in Hollywood. Built around 1925, the structure has received grants for technical assistance, repair, and restoration, and work is under way. Photo: Lisa Snyder for the Los Angeles Conservancy.

The Partners project developed a computer program to pinpoint historic buildings damaged in the quake. The survey of buildings inspected by City of Los Angeles officials—which grew from 12,000 structures after the first day to more than 80,000 one month later—was electronically compared against the State of California Inventory of Historic Properties—more than 8,000 structures in Los Angeles alone. This created a computer-generated list of 171 significant structures in Los Angeles that sustained damage from the earthquake—58 buildings posted unsafe by city inspectors and 113 buildings with limited entry.

Using the initial work of the technical assistance teams and the preliminary estimates of damage generated by computer and field survey, the consortium developed a more comprehensive response plan. Other organizations and agencies, including the National Park Service and the California Preservation Foundation, joined the response project.

In February, $5 million was allocated to the Partners from the emergency earthquake disaster relief package approved by Congress and signed into law by President Bill Clinton. With funding now on its way, the program staff, sharing offices with the Los Angeles Conservancy, was expanded from a project manager and two assistants to include three field directors, a grants administrator, and an administrative assistant.

Based on the federal funding, the Partners have established two grant programs to assist in restoration efforts. Technical assistance grants—varying in amounts up to $10,000 per recipient—are available to organizations, cities, and property owners of historic structures for feasibility studies, architectural and engineering services including structural analysis, and historic preservation reports. The grants can also fund community or district economic recovery assessment.

More than $3 million is available to provide funding for repair and restoration of buildings in the National Register of Historic Places or structures determined eligible for inclusion in the register. It is envisioned that the bulk of this money will be distributed in small awards to assist as many historic buildings as possible.

Mr. Brink considers the team effort demonstrated by the Partners to be "a real breakthrough." Ms. Dishman agrees. "The Partners program is exciting because we are pooling our resources in a way that provides more services to people who need help," she says.

Jane Slate Siena, Head of Institutional Relations at the Getty Conservation Institute, sees the partnership as a model for what is still necessary at a national level. "To deal with a local catastrophe, we've created a working partnership of cultural heritage groups that includes the private sector and government, local and national organizations," she explains. "But this won't be the last disaster. We need to develop a strong partnership nationally so that future emergencies, wherever they occur, will be confronted with a focused and coordinated response."

John Hinrichs, a Hollywood-based writer who specializes in arts, culture, and politics, is the communications consultant for Historic Preservation Partners for Earthquake Response.

The Getty Conservation Institute

Preserving Safety and History: The Getty Seismic Adobe Project at Work

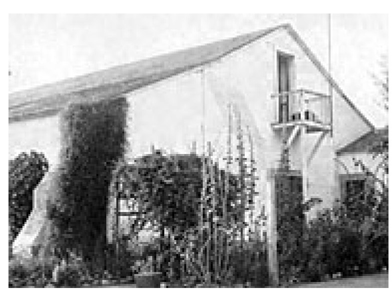
By William S. Ginell and E. Leroy Tolles

The destruction wrought by California's periodic and often violent earthquakes is a grim reminder that many historic and culturally significant buildings pose substantial risks to the life and safety of their occupants. In addition, the damage to our Spanish colonial and early American heritage—in the form of irreplaceable historical fabric, architectural details, objects, and decorations—increases with each new seismic event. California's historic adobe structures, which include missions and secular buildings, have been particularly hard hit by devastating earthquakes.

Although we now understand a good deal about the behavior of modern reinforced masonry buildings during quakes, until recently little was known about the factors that determine how adobe buildings respond to seismic forces. In 1990 the Getty Conservation Institute undertook a research project to study methods for retrofitting historic adobe structures—minimally intrusive methods consistent with maintaining the architectural, historic, and cultural values of the buildings. The material most commonly used for retrofitting adobe buildings is steel-reinforced concrete. Its installation is extremely invasive and can result in the destruction of much of a structure's historic fabric in an attempt to save it (see When The Earth Moves).

Rancho Camulos, as it appeared in 1895.
Photo: Adam Clark Vroman. Courtesy Seaver Center for Western History Research, Los Angeles County Museum of Natural History.

he primary objective of the Getty Seismic Adobe Project (GSAP) was to develop relatively inexpensive and less-invasive techniques that could limit the danger to life by preventing structural collapse of adobes. The principal mode of failure of adobe walls is out-of-plane overturning, which can often be prevented when adequate connections to the floor and/or roof systems are assured, since adobe walls are often two to three feet thick. Other damage that may lead to collapse can be reduced or prevented by limiting the relative displacement of the large wall blocks that are formed after cracking. The problem for the project was not how to prevent cracks from occurring: in a moderate to large earthquake, adobe walls inevitably crack into large blocks. The task instead was to determine how to prevent overturning by keeping those blocks in place during continued shaking. Where thin adobe walls are concerned, mid-height failure may also occur, and the means to prevent this type of damage required investigation.



Work was based on the premise that if significant shifting in cracked portions was prevented—and mid-height failure eliminated—an adobe would remain stable. Earthquake-simulation tests were carried out on model adobe buildings, both retrofitted and unmodified. As part of the project, nine small-scale (1:5) and two large-scale (1:2) model buildings were constructed and tested on computerized earthquake-simulation shaking tables that subjected the models to "quakes" of increasing severity. A wealth of information was accumulated on how adobe buildings respond to simulated earthquakes and how retrofitting can prevent catastrophic damage. Tests showed that the use of nylon straps and thin, flexible steel rods strategically installed in an existing adobe could greatly enhance the stability of the building by preventing walls from overturning.

The 1994 Northridge earthquake in Los Angeles vividly demonstrated once again the destruction that can be sustained by adobe buildings. One such building, the Del Valle Adobe at Rancho Camulos, located about 18 miles northwest of the epicenter, was damaged extensively. Now this adobe has become the first historic structure to be retrofitted in light of the results of the GCI's work under GSAP.

Two views of a section of Rancho Camulos, before and after the 1994 Northridge earthquake. Photos: Courtesy Shirley Lorentz.

The Del Valle Adobe, situated near Piru, California, is a rancho of Mission San Fernando and is considered an outstanding stylistic example of California's old ranchos. Established as a nonprofit organization in 1994, the 40-acre site, now called the Rancho Camulos Museum (part of a much larger, functioning 1,400-acre ranch), includes the adobe main residence, a brick winery, a smaller adobe outbuilding, and the original chapel. Many of the historic features of the buildings—such as the cocina (kitchen), the Greek Revival detailing of the fireplaces, chair railings, and corredor posts—remain as exemplars of early California architecture. The main residence is one of the attractions of the rancho because it served as the model for the home of the heroine in the well-known romance novel *Ramona* by Helen Hunt Jackson; the novel is noted for its portrayal of the idyllic pastoral days of early California.

The earliest portion of the building, constructed in 1841, consists of three rooms that are one-and-one-half stories in height and a one-story, one-room extension. Over the years, the building evolved into a u-shaped complex with a central courtyard. The single-story room, known as Ramona's room, is situated at the southeast corner. During the earthquake, two walls of Ramona's room collapsed. The gable-end wall at the southeast corner was severely damaged but did not collapse; the stone walls at the north end of the west wing suffered severe cracks at the corners.

Crack damage occurred throughout the building, especially at corners and, because of pounding, at wall intersections. Spalling of interior and exterior plaster was extensive, as was the collapse of adobe in areas that had been weakened by previous repeated exposure to water. In many locations, the walls had pulled away from the ceiling joists, and damage to the walls further reduced their ability to support the joists. The severe damage to the building probably resulted from a combination of factors: the lack of structural elements either tying the walls together or tying the roof-ceiling system to the walls, the presence of pre-existing earthquake-related cracks, and water damage that weakened the lower sections of the adobe walls and foundation.

As part of GSAP, a team consisting of E. Leroy Tolles, Anthony Crosby, Edna Kimbro, and Frederick Webster surveyed the extent of Northridge earthquake damage to historic adobe structures, including Rancho Camulos, immediately after the earthquake (the survey findings were later published by the GCI). At the request of the Rancho Camulos owners, a damage assessment was made; emergency shoring and bracing plans were formulated; and a strategy for obtaining repair financing was developed.

Ultimately, federal funding of $500,000 was obtained through a program administered by the Historic Preservation Partners for Earthquake Response, a collaborative project of the National Park Service, the National Trust for Historic Preservation, the California Office of Historic Preservation, the Los Angeles Conservancy, the California Preservation Foundation, and the GCI. Additional funding of $250,000 was obtained from the County of Ventura.

The major part of the funding provided for the installation of a complete seismic retrofit system using the technology developed under GSAP. A portion of the funds was used for repair of the main residence and for stabilization of the winery and the small adobe outbuilding. Tolles, who was also principal investigator for GSAP, led the private design team for the project. He was joined by Crosby, a historical architect, and Kimbro, a historian and architectural conservator. The design team worked with Steade Craigo of the California State Office of Historic Preservation and with

A detail of the east gable during

the Ventura County Department of Building and Safety to ensure that the design conformed to the U.S. Secretary of Interior Standards for restoration of historic properties, and was in compliance with the safety requirements of existing building codes.

repair and seismic retrofitting. Visible is a horizontal steel cable with cable ties, and a stress distributing end plate.
Photo: William S. Ginell.

The design of the retrofit project was based largely upon the results of the GSAP research. Indeed, this effort involving an existing earthquake-damaged adobe building was the initial application of the principles and techniques that were studied and experimentally validated at the GCI. Because the techniques and technology were innovative and had not been previously implemented, a careful review of the proposed retrofit measures was carried out.

These measures included horizontal cables around perimeter walls which, in some areas, were anchored to ceiling joists; vertical cables or straps on both sides of adobe walls that were either too thin or particularly vulnerable due to damage from past earthquakes; vertical center-core rods that were placed in newly constructed walls; and anchorage at the floor levels. To our knowledge, this was the first time that pretensioned, vertical stainless steel cables recessed into walls had been used on an adobe structure (they had been previously used to reinforce stone walls for which the height-to-thickness ratio was greater than eight).

A vertical steel cable recessed into an exterior wall. The cable will be prestressed, then covered with adobe mortar.
Photo: William S. Ginell.

This first implementation of the GSAP research results required some redesign of laboratory-tested details for application to real-world conditions. It also required acceptance by building officials and by the California Office of Historic Preservation, as well as input and review by the building owners, who were particularly concerned about safety in and around their building. The seismic retrofit and repair of the main building have been completed, and it is anticipated that repair of the winery will be carried out in the near future.

Detailed information on the Institute's research into seismic strengthening—and on the retrofitting recommendations growing out of that research—will be available in two forthcoming publications from the GCI. The first, *GSAP Final Report*, will provide a comprehensive description of six small-scale and two large-scale tests conducted to determine the effectiveness of several retrofitting techniques. The second, *Planning and Engineering Guidelines for Seismic Retrofitting of Adobe Buildings*, will offer specific recommendations on how to fortify historic adobes against seismic destruction in a manner that preserves the integrity and authenticity of this important part of our heritage.

William S. Ginell is a senior conservation scientist with the GCI, and project director of GSAP. E. Leroy Tolles served as the principal investigator of GSAP.

A detail of a steel cable and nylon tie.
Photo: William S. Ginell.