

2003 SAN SIMEON, CALIFORNIA EARTHQUAKE

RMS EVENT REPORT



INTRODUCTION

On Monday, December 22, 2003 at 11:15:56 AM (PST), a $M_w 6.5$ (moment magnitude) earthquake struck the coast of central California, approximately 6 miles (11 km) from the coast village of San Simeon in San Luis Obispo County. The earthquake was at a depth of 4.7 miles (7.6 km), originating on the northern end of the San Simeon/Oceanic/HosGri Fault System (Figure 1a). Numerous aftershocks were recorded by the USGS following the main earthquake event.

RMS dispatched a reconnaissance team to the area within 24 hours of the main shock. The reconnaissance team surveyed damage in the cities of San Miguel, Paso Robles, Templeton, and Atascadero, as well as some of the Central Coast wineries (See Figure 1b for location map). Their observations on general commercial, public facility, wine industry, and residential damage, as well as findings on insurance and economic impacts are presented in this report.



Figure 1a. USGS intensity map of December 22, 2003 event



Figure 1b. Central Coast Map with portions of San Luis Obispo County

COMMERCIAL BUILDING DAMAGE

The most significant structural damage was observed in the historic downtown area of Paso Robles (pop 27,000), located approximately 24 miles (39 km) west northwest from the epicenter. Paso Robles has had an award-winning, federally-funded Main Street program focused on downtown revitalization. Some building owners had received funds under the program for building improvements, including retrofits, but this work had not been undertaken prior to the December 22 earthquake.

Significant damage to old, unreinforced masonry buildings was primarily located between 14th and 12th Streets (on the north and south) and Spring and Railroad Streets (on the east and west) (Figure 2). While access to this area was restricted, the reconnaissance team did observe first hand significant structural damage to many of the perimeter buildings, as well as widespread non-structural damage throughout the downtown area.

Eighty-one buildings were evacuated in the downtown area. As of December 31, 2003, the City of Paso Robles reported that 33 buildings in the downtown area have been red-tagged (and therefore deemed unsafe to enter by building inspectors), and approximately 20 other buildings have been yellow-tagged (and therefore access is restricted until the questionably unstable structures can be stabilized).

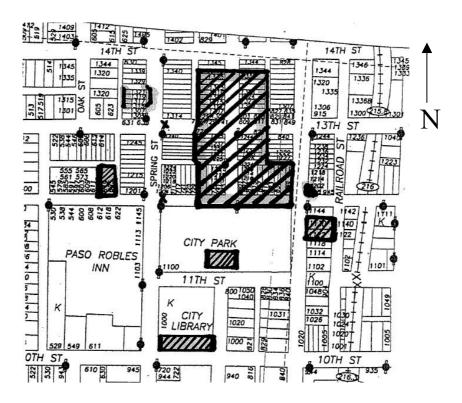


Figure 2. Restricted access map to properties in downtown Paso Robles as of December 24, 2003 (City of Paso Robles)

The worst damage was to the historic, two-story Mastagni building on the corner of Park and 12th Streets (Figure 3). Built in 1892 with a landmark clock tower, the timber roof collapsed when the unreinforced brick masonry wall on the west side of the structure fell out-of-plane, destroying several small businesses and a row of parked cars. While this type of collapse to an unreinforced

masonry building is not uncommon for strong earthquakes, it is interesting to note that both the lateral resistance of the structure was weaker in the east-west direction and the more significant ground shaking was in the east-west direction. The two deaths recorded in the earthquake were caused by the roof collapse of the Mastagni Building.





Figure 3. Collapsed roof of Mastagni Building in downtown Paso Robles (a) looking north at the corner of $12^{\rm th}$ and Park Streets; (b) looking northeast down Park Street

Upon arrival in downtown Paso Robles, the RMS team spoke with business owners within the 3-block affected area. The majority reported that they did not have earthquake insurance. Most had thought about purchasing coverage, but did not due to the quoted deductible levels of \$10,000 to \$30,000. Moreover, with the closure of the buildings and damage to inventory, most business owners expected to lose valuable holiday business. Thirty businesses remained closed a week after the earthquake. Park Cinemas, located in a 5-year old building across the plaza from the collapsed Mastagni building, had only minor contents damage, but was closed until Friday with an expected revenue loss of \$15,000 to \$20,000 a day.

Some interesting examples of damage to masonry structures in the downtown area are shown in the following images (Figures 4 through 6), taken by the RMS reconnaissance team. In Figure 4, the load bearing masonry wall of the Carnegie Library, a structure dating from the early 1900s and listed on the National Register of Historic Places, suffered severe cracking. Located in the center of City Park, the building was red-tagged within 24 hours of the event. After further inspection by the City of Paso Robles, it was discovered that the building shifted off its foundation and structural retrofit and repair costs are estimated to be \$3 million.

In contrast, in Figure 5, only minor damage to the brick façade of the one-story Cingular Wireless building at the corner of 13^{th} and Pine Streets was evident. This was primarily due to the seismic retrofit anchors seen at the roof line, creating a better connection between the masonry walls and the roof to carry the seismic load.



Figure 4. Structural damage to masonry wall of historic Carnegie Library in City Park, Paso Robles

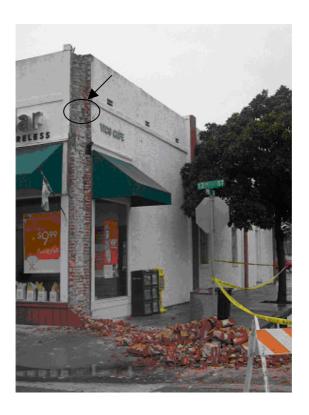


Figure 5. Minor structural damage to brick façade of Cingular Wireless building at the corner of $13^{\rm th}$ and Pine Streets, Paso Robles - Major damage was averted due to the seismic retrofit anchors strengthening the connection between the roof and the walls (circled above)

In Figure 6, an unreinforced masonry structure with a pier foundation suffered severe cracking at the base of the brick wall. This structure, built in 1889 and located at 14th and Pine Streets, housed a restaurant. Unfortunately, the building was red-tagged by the inspector and the owner had no earthquake insurance. There was concern among other business owners in the area that the building, which was part of the El Paso de Robles Historical Society, would be torn down.



Figure 6. Cracking in the unreinforced masonry wall of a restaurant at $14^{\rm th}$ and Pine Streets, Paso Robles

The historic Paso Robles Inn, located at 1103 Spring Street in downtown Paso Robles, suffered minor damage to its restaurant (Figure 7). There was also more significant damage to the masonry walls of some of the guest quarters.



Figure 7. Damage to Paso Robles Inn, where there was window damage and loss of roof tiles (courtesy of the Earthquake Engineering Research Institute (EERI))

Other major damage to the city of Paso Robles was encountered in the parking lot of the Library/City Hall at 1000 Spring Street. Water from underground hot sulphur springs, over which the city center was built, was seen upwelling though a hole in the parking lot. On the day following the earthquake, city workers were attempting to discover the source of the water and to stem its flow (Figure 8). Approximately 500 gallons per minute were recorded and the rupture appeared to be growing in the days following the main shock, though reports suggest the water flow was stemmed significantly during the week following the event. On December 30, the City of Paso Robles estimated it would cost \$2 million to eliminate the problem with the underground hot springs over the long-term.



Figure 8. 1000 Spring Street, Paso Robles, California, where crews were working to stem water flow from underground hot springs

Further afield, the team did not investigate the coastal communities of Cambria and San Simeon, near to the epicenter, because of road closures. However, the latest reports from the City of Cambria indicate that commercial buildings sustained minor structural and contents damage. In San Simeon, Hearst Castle was closed for only one day, reopening on December 23 after suffering no significant damage.

PUBLIC FACILITIES DAMAGE

The Twin Cities Hospital at Templeton, between Paso Robles and Atascadero, coped well with the earthquake shock. The emergency response plan for the hospital was initiated without problems and the hospital sustained only minor non-structural damage, with a few ceiling tiles falling, and minor structural damage, with cracking along a column at the entrance to the hospital's emergency room. There was a brief power outage, but emergency generators came on-line smoothly. Many of the more than 40 reported injuries in this earthquake were treated at this hospital.



Figure 9. Minor damage at column connection to Twin Cities Hospital in Templeton

Initially following the earthquake, there were reports of major damage to City Hall in Atascadero. This structure, built in 1918, suffered significant damage to its brick façade, particularly near the roof line of the rotunda (Figure 10). Also reported were significant cracking in the walls throughout the building and considerable contents damage to display cases in the lobby.



Figure 10. Damage to brick façade of the Atascadero City Hall (courtesy of EERI)

WINE INDUSTRY DAMAGE

The largest industry in the affected region is the wine industry. More than 80 wineries can be found surrounding Paso Robles. The area is one of California's most productive wine regions, accounting for \$170 million a year in revenue in San Luis Obispo County. The RMS team visited a few wineries to the west of Paso Robles, between Highway 101 and Highway 46, where there were reports of damage. They found little structural damage to buildings; most damage was to contents and stock. At one of the smaller wineries, there was no damage at all (Figure 11).



Figure 11. Barrels were shifted but no stock was lost at Pipestove Vineyards

Several wineries reported collapsed piles of barrels and broken barrels and bottles. Winery stock is particularly vulnerable to earthquake damage, as it is usually stored in stacks of barrels, which are prone to collapsing when shaken. Mid-winter is also when most stock is in storage, after harvesting from the previous year and before its bottled and sold. Losses come from the lost wine stock, cases, and barrels, as well as wine damage to interiors and carpets. Some highlights are as follows:

- Justin Vineyards & Winery, at the far western end of Paso Robles, had structural damage to the house and lost hundreds of bottles of wine in the tasting room along with hundreds of gallons from broken barrels. Wine soaked into carpets and the owners had to close for several days as well as cancel two events planned for the weekend.
- Turley Wine Cellars, located close to Highway 101, lost an estimated \$1 million worth of wine after 700 barrels were damaged, and described a river of wine flowing from the barrel room (Figure 12).
- The small Dover Canyon Winery, also on Paso Robles' west side, sustained some structural damage to the main house and lost around 100 gallons of wine.

Mastantuano Winery sustained an estimated \$90,000 loss after they lost around 1,000 gallons out of 47,000 gallons of wine (Figure 13). They sustained losses to some large tanks and contents from shelves and told the RMS team that they had no earthquake insurance, in common with most of the wineries in the area.

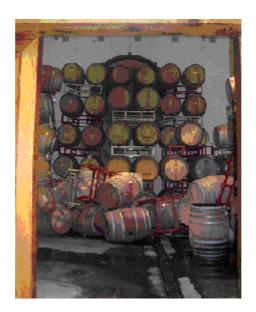


Figure 12. Collapsed stack of barrels and wine loss at Turley Vineyards



Figure 13. Minor damage at Mastantuano Winery (a) to a large storage tank and (b) one barrel

RESIDENTIAL BUILDING DAMAGE

The RMS reconnaissance team investigated residential homes in Paso Robles, Templeton, and Atascadero. Moderate to major damage was seen in Paso Robles and major damage was evident in a few homes located in the hills of Atascadero. The team found no visible signs of damage or building inspection tags in the older, main street area of Templeton. The RMS team spoke to a few homeowners in Paso Robles and Atascadero and only one had earthquake insurance.

According to the Insurance Information Network of southern California, a typical homeowners policy will cost between \$600 and \$800 a year and have a 10% to 15 % deductible. Moreover, only about 17% of California homeowners currently have earthquake coverage. Within the three affected counties of San Luis Obispo, Monterey and San Benito, the California Earthquake Authority (CEA) has 20,000 active policies, a penetration rate of only 7.8% of the total number of households in these three counties in the last census.

The damage patterns seen in the older residential neighborhoods of Paso Robles surrounding the damaged downtown area were mostly chimney damage (Figure 14a) with a few indications of cracking along foundation lines and one evident example of porch damage, where the front porch was braced by temporary stilts. Several residents in Paso Robles reported contents damage. According to one report, 1,000 homes in the town were inspected for safety purposes.





Figure 14. Chimney damage to residential buildings: (a) Major damage to chimney in Paso Robles, where the interior has been exposed due to chimney collapse; (b) Less severe damage to a chimney in Atascadero

The reconnaissance team found cases of more severe structural damage in Atascadero, approximately 12 miles (20 km) to the south of Paso Robles, particularly in hillside subdivisions where ground failure was evident. A few homes in this area shifted off their foundations, although many others had less substantial damage to contents, windows, and chimneys (Figure 14b). There were slope failures along San Gregorio Road in Atascadero, where the more significantly damaged homes were evident (Figure 15).



Figure 15. Slope failures were visible near to structurally damaged houses in the hills of Atascadero

The RMS team was able to investigate in detail two 1970's vintage wood-frame hillside residences that were severely damaged. The first home, built in 1973, had been shifted from its foundation in the earthquake. Upon inspection of the foundation level in the garage, it was discovered that there were no anchor bolts connecting the wood frame wall to the concrete foundation (Figure 16a). Further inspection of the property showed severe cracking to the bearing walls, particularly around the window openings. The structure, built on a fairly steep slope, had been yellow-tagged as uninhabitable, and homeowners reported that they expected it to be a total loss with the amount of cracked walls, broken windows and contents damage (Figure 16b). While the owners of this house did have earthquake insurance, it was unclear if they were going to try to rebuild.





(a) (b)

Figure 16. Yellow-tagged residential property in hills of Atascadero shifted from its foundation: (a) Wood frame wall separated from concrete pier, showing no anchor bolts at connection; (b) Severe contents damage

A nearby home of the same vintage was another interesting case of the impact of the lack of sufficient strength at building connections. This home, also on a steep slope, had been red-tagged and surrounded by a mesh wire fence to keep individuals from entering the structure. In this case, there was a weak connection at the roof line and at the crest of the roof, there was a visible split (Figure 17a). In addition, ground failure was evident on the property, with one half of the house sliding down the hill due to slope instability (Figure 17b).





Figure 17. Red-tagged residential property in hills of Atascadero disturbed from its foundation: (a) Roof crest split in half; (b) Subsidence of the right half of the house due to slope instability

OVERALL INSURANCE AND ECONOMIC IMPACTS

The RMS reconnaissance team saw no surprises in the damage patterns to Central California as a result of the December 22, 2003 earthquake event. The damage to the commercial unreinforced masonry buildings was typical, as was the damage to the residential unbraced masonry chimneys. Homes built on steep slopes, especially those built over 30 years ago and without any type of seismic retrofit, were more susceptible to damage. Finally, unsecured contents can suffer considerable damage, as was the case here with (very high value) wine barrels.

Overall, the RMS team found widespread low-level damage to windows and contents in an area of around 25 miles (40 km) surrounding the earthquake epicenter. The most notable damage was located to the east of the epicenter, in Paso Robles and immediate surroundings. The team consistently heard from business owners that the majority did not have earthquake coverage, due to high premiums and deductibles. Most likely, the earthquake will stimulate an increase in demand for earthquake insurance in the immediate future.

On December 27, 2003, San Luis Obispo County officials estimated that the total economic costs of the earthquake are likely to exceed \$200 million. RMS estimates that the total property and casualty insurance losses will be in the region of \$40 to \$60 million. RMS estimates that nearly all of this loss will occur in San Luis Obispo County with very limited losses possible in Monterey, Santa Barbara, and Fresno counties.

According to the RMS Earthquake Workers Comp industry exposure database, approximately 29,000 workers were exposed to the strong shaking (at the time this earthquake occurred). However, given that the earthquake occurred during a holiday week, the exposure is likely to be less. Based on the latest information on casualties, RMS expects that workers comp losses are likely to be in the region of \$2 to \$3 million.