Geologic Hazards Photos Volume 2
Earthquake Events

Earthquakes in Southern California, 1979-1989

The Imperial Valley Earthquake of October 15, 1979 Epicenter: 32.6-deg N, 115.3-deg W; depth: 7 km; magnitude 6.8; damage: $30 million; no deaths.

The earthquake was felt over approximately 128,000 sq. km. The worst damage occurred in southern Imperial County and northeastern Baja California where eleven businesses and two homes were destroyed. Four hundred forty businesses and 1,565 homes were damaged. Although there were no deaths, 91 people were reported injured, mainly by flying glass or by falling objects.

The greatest single structural loss was to the Imperial County Services Building in El Centro, California. Non-structural damage included damage to bridge abutments that were cracked and roadbeds that shifted due to slumping or faulting. There was damage to canals and irrigation ditches, and also to subsurface drain tiles which were disturbed by the movement along the Imperial Fault. The worst damage was to the All-American Canal which brings Colorado River water into the Imperial Valley. Ground shaking caused the collapse of levees along a 13-km stretch of the canal east of Calexico. Extensive lateral slope failure occurred along this and other canals. In some places, canal banks settled by more than 1 m.

The Westmorland Earthquake of April 26, 1981 Epicenter: 33.1-deg N, 115.6-deg W; depth: 4 km; magnitude 6.3 ML(B); damage: $1-3 million; no deaths.

Twelve buildings in Westmorland were severely damaged, ten beyond repair, and an additional 30 sustained minor damage. Seventy percent of the town's 900 were damaged, and five homes were condemned. Six mobile homes were knocked off their foundations and nine homes sustained minor damage to foundations, porches, and walls. Electrical service was interrupted for one hour and the water supply was interrupted for 10 hours. The sewage plant sustained an estimated $40,000 damage. Total damage was estimated at $1.5 million.

Subsidence was reported on several rural roads in the area. Liquefaction caused scores of "mudpots," and oozing soil in nearby fields. One country road west of Westmorland collapsed, producing a 2-foot drop-off. In rural areas, $100,000 in damages was incurred when unreinforced, concrete-lined irrigation canals were broken.

The Palm Springs Earthquake of July 8, 1986 Epicenter: 34.0-deg N, 116.6-deg W; depth: 10 km; magnitude 6.0; damage: $4.5 million; no deaths.

At least 29 people were injured and some damage occurred in the Palm Springs-Morongo Valley area. Landslides also occurred. The quake caused serious damage at the Devers substation of Southern California Edison Company. Some residences in the Whitewater Canyon area were badly damaged. Damage from this quake totaled $4.5 million. Minor damage occurred at Angelus Oaks, Desert Hot Springs, North Palm Springs, Palm Desert, Palm Springs, and Yucca Valley. The quake was felt throughout much of southern California and in Las Vegas (Nevada), Lake Havasu City (Arizona), and in the northern Baja California area of the United States and Mexico.

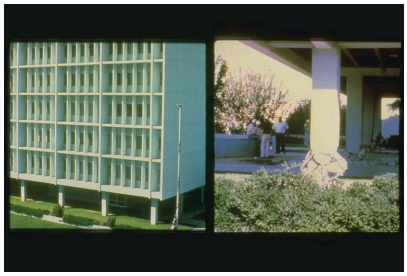
The Whittier Narrows Earthquake of October 1, 1987 Epicenter: 34.0-deg N, 118.1-deg W; depth: 11 km; magnitude 5.9; damage: $358 million; 8 deaths.

At 7:42 A.M. (Pacific Daylight Time), on October 1, 1987, a fault located about 11 km below the surface and 20 km east of downtown Los Angeles, California, began to rupture. The fault was an extension of the previously identified Whittier Fault. The resulting earthquake caused about $358 million in property damage and the loss of 8 lives.

Severe damage was confined mainly to communities east of Los Angeles and near the epicenter. No severe structural damage to high-rise structures in downtown Los Angeles was reported. Non-structural damage did occur, however. In Whittier, the most severe damage occurred in the "Uptown" business district. Similar damage was observed in the older, downtown section of Alhambra and in the "Old Town" section of Pasadena. These areas had high concentrations of unreinforced masonry buildings.

Residences which sustained damage were usually constructed of masonry, were not fully anchored to foundations, or were houses built over garages with large door openings. Many chimneys collapsed and in some cases, fell through roofs. Wood-frame residences sustained relatively little damage. Damage often occurred around large windows. Light fixtures and suspended ceilings fell in many buildings within a 10-km radius of the epicenter. A student at California State University, Los Angeles, was killed when the connectors for a precast, concrete fascia panel failed and the panel fell two stories crushing her. Damage was incurred on a bridge at the interchange of I-605 and I-5, where the columns in the center were severely damaged.

Slide Set Images



Imperial County Services Building Before and After 1979 Earthquake Left: Imperial County Services Building (El Centro) before the earthquake. Right: After the earthquake. There is support pillar failure at the east end of building. This 6-story reinforced concrete frame and shear wall structure was completed in 1971 at a construction cost of $1.87 million. It was designed to be earthquake resistant. However, during the quake the concrete at the base of the support columns shattered and the vertical reinforced bars were severely bent, allowing the east portion of the building to sag about 30 cm. Replacement costs were estimated at $7 million. [Photo credits: Bay Area Regional Earthquake Preparedness Project and U.S. Geological Survey.]

Earth Cracks near El Centro from 1979 Earthquake Earthquake of October 15, 1979, Imperial Valley, California. Earth cracks near El Centro, California. Such cracks caused the breakage of underground water pipes in many places. However, utilities were interrupted for only a short period of time. [Photo credit: University of Colorado.].

Sand Boil Near El Centro, 1979 Earthquake of October 15, 1979, Imperial Valley, California. A sand boil near El Centro provides graphic evidence of liquefaction. Such boils were found along the southern extent of the Imperial Fault. Liquefaction occurs when earthquake ground shaking distorts the granular structure of the ground causing some loosely packed groups of grains to collapse together. Each collapse transfers pressure from the grain groups to the water. When the pore-water pressures reach a critical level, the granular material suddenly behaves as a liquid rather than a solid. Liquefaction has taken place. [Photo credit: G. Reagor, U.S. Geological Survey.]

Merchandise on Floor After 1979 Imperial Valley Earthquake Earthquake of October 15, 1979, Imperial Valley, California. Merchandise that fell from shelves in Brawley Drug Store. Aftershocks continued for several months. Several shocks were strong enough to knock merchandise from shelves and to break display windows in the area. [Photo credit: G. Reagor, U.S. Geological Survey.]

Fallen Porch after 1979 Imperial Valley Earthquake Earthquake of October 15, 1979, Imperial Valley, California. Fallen porch on 200 block of "G" Street in Brawley. Several homes were damaged in this block. Most of the residential damage was to chimneys. [Photo credit: G. Reagor, U.S. Geological Survey.]

Fault Trace across Lettuce Field, 1979 Imperial Valley Earthquake Earthquake of October 15, 1979, Imperial Valley, California. A fault trace crosses a cultivated field near El Centro. The surface rupture on the Imperial Fault extended from about 2.5 miles (4 km) north of the International Border to about 2.5 miles south of Brawley. Maximum lateral displacement was about 22 inches (55 cm) at Heer Dunes and the maximum vertical displacement was 7.5 inches (19 cm) southeast of Brawley. [Photo credit: University of Colorado.]

Damage to Theater at Brawley, 1979 Imperial Valley Earthquake Earthquake of October 15, 1979, Imperial Valley, California. The unreinforced brick wall at the Brawley Theater collapsed. Most of the building damage in the business district of Brawley occurred between the 500 and 900 blocks. Unreinforced brick structures are particularly vulnerable to earth shaking. [Photo credit: Bay Area Regional Earthquake Preparedness Project.]

Damage to Adobe Building in Westmorland, CA, 1981 Earthquake of April 26, 1981, Westmorland, California. View of a partially collapsed adobe building in Westmorland. Seventy percent of the 900 homes in Westmoreland were damaged. Most, like this structure, were constructed of adobe and/or brick. [Photo credit: Bay Area Regional Earthquake Preparedness Project.]

Collapsed Building in 1981 Westmorland, CA Earthquake Earthquake of April 26, 1981, Westmorland, California. View of a two-story building which partially collapsed in the earthquake. Note the undamaged one story building on the left. Twelve buildings were severely damaged and an additional thirty sustained minor damage. City officials ordered the demolition of ten downtown buildings that were damaged beyond repair. [Photo credit: Bay Area Regional Earthquake Preparedness Project.]

Porch Damage, 1986 Palm Springs, CA Earthquake Earthquake of July 8, 1986, Palm Springs, California. This porch was separated from the trailer and damaged by the quake. Trailers incurred more structural damage than any other type of structure in this earthquake. [Photo credit: Bay Area Regional Earthquake Preparedness Project.].

Rockfall on Highway after 1986 Palm Springs Earthquake Earthquake of July 8, 1986, Palm Springs, California. This rockfall on the highway is just one of many landslides that occurred in the Palm Springs, California, area. Such rockfalls can temporarily block roads and highways and hinder the movement of emergency vehicles. [Photo credit: Bay Area Regional Earthquake Preparedness Project.]

Damage to Display Window, 1986 Palm Springs Earthquake Earthquake of July 8, 1986, Palm Springs, California. A broken display window in downtown Palm Springs. Display windows often break in moderate magnitude earthquakes since the window occupies a large, structurally-unsupported area of the building subject to torsional forces. [Photo credit: Bay Area Regional Earthquake Preparedness Project.]

Collapsed Concrete Block Fence Due to 1986 Palm Springs, CA Earthquake Earthquake of July 8, 1986, Palm Springs, California. This concrete block fence near a trailer park collapsed during the quake. Such fence failures were common. Note bent reinforcing rod. [Photo credit: Bay Area Regional Earthquake Preparedness Project.]

Two Views of Auditorium Showing Damage of 1987 Whittier, CA Earthquake Earthquake of October 1, 1987, Whittier Narrows, California. Left: San Gabriel Civic Auditorium after the main shock and before the large aftershock. Note cracks near the bell tower. Right: The same structure showing damage that occurred during the large aftershock. The bell tower that was weakened by the main shock has fallen, and the exterior of building is damaged. [Photo credit: G. Reagor, U.S. Geological Survey.]

Partial Collapse of Store in 1987 Whittier, CA Earthquake Earthquake of October 1, 1987, Whittier Narrows, California. Partial collapse of the back wall of a thrift store located on Main Street between Fifth and Sixth Streets in Alhambra. Falling bricks crushed cars parked in the street. [Photo credit: G. Reagor, U.S. Geological Survey.]

Shift of Apartment Building in 1987 Whittier, CA Earthquake Earthquake of October 1, 1987, Whittier Narrows, California. The Garvey West Apartment building in Monterey Park (at Monterey Pass Road in Garvey) shifted about 10 inches to the east on its foundation. Shown here is the southeast corner of the building. [Photo credit: G. Reagor, U.S. Geological Survey.]

Partial Collapse of Parking Garage, Whittier, CA, 1987 Earthquake Earthquake of October 1, 1987, Whittier Narrows, California. Partial collapse of the May Company's three-level parking garage at Quad Shopping Mall in Whittier. The structure, built in 1965, is located at the corner of Whittier Boulevard and Painter Avenue. [Photo credit: G. Reagor, U.S. Geological Survey.]

Exterior View of Damaged Residence, Whittier, CA 1987 Earthquake Earthquake of October 1, 1987, Whittier Narrows, California. Left: Exterior view of a badly damaged brick residence in the 5000 block of Bright Street in North Whittier. Right: Interior view shows cracks extending through the outside wall of structure. [Photo credit: G. Reagor, U.S. Geological Survey.]

Interior View of Damaged Residence, Whittier, CA 1987 Earthquake Earthquake of October 1, 1987, Whittier Narrows, California. Collapse of the chimney through the roof of the same residence (see slide 18). The chimney fell onto the bed of a four-year old boy who was rescued and hospitalized with a broken collar bone. [Photo credit: G. Reagor, U.S. Geological Survey.]

Collapse of Wall of Store in 1987 Whittier, CA Earthquake Earthquake of October 1, 1987, Whittier Narrows, California. Collapse of the wall on the second story of Art's Jewelry and Loan establishment on Greenleaf Avenue in "Uptown Whittier." This older section in north Whittier sustained serious damage. At least 200 residences and 30 businesses were badly damaged. Most of the severe damage was to structures built before 1930. [Photo credit: G. Reagor, U.S. Geological Survey.]

Return to the Geologic Hazards Guide