

Building codes, quake sites lessen toll

By Lee Siegel
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PASADENA, Calif. — Weaker earthquakes have killed thousands of people. But California's strongest quake in four decades claimed only one life, thanks to tough building codes, firm ground and wide open spaces.

The quake's early morning timing and the fact that it focused energy away from nearby towns also kept the death toll low.

"The main thing is that it happened in the middle of nowhere," said John Hall, professor of civil engineering at the California Institute of Technology.

The magnitude-7.4 quake struck at 4:58 a.m. Sunday in the Mojave Desert near Landers about 110 miles east-northeast of Los Angeles. It was California's strongest since 1952, when the magnitude-7.7 Tehachapi quake killed 12 people in Bakersfield. The Landers quake was followed at 8:05 a.m. Sunday by a magnitude-6.5 quake near Big Bear.

More than 350 people were injured. Two people died of heart attacks after the Landers quake. But the only death definitely attributed to the jolt was that of 3-year-old Joseph Bishop.

Quakes smaller than Sunday's kill thousands of people in nations where building codes are far less strict than in California.

"California has done a great job with building codes and the earthquake occurred in a safe place," said Al Lindh, a U.S. Geological Survey scientist.

State building codes first were strengthened after the magnitude-6.3 Long Beach earthquake in 1933 killed 115 people and in-

List of smaller quakes, death toll

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- March 13, 1992, Turkey, magnitude 6.8, up to 800 deaths.
- Oct. 19, 1991, India, 6.5, 2,000.
- June 28, 1991, Sierra Madre, Calif., 5.8, two.
- Jan. 31, 1991, India, 6.6, 700.
- Oct. 17, 1989, San Francisco Bay region, magnitude 7.1, 63 deaths.
- Dec. 7, 1988, Soviet Armenia, 6.9, 25,000.
- Oct. 1, 1987, Whittier, Calif., 5.9, seven.
- Oct. 30, 1983, Turkey, 7.1, 1,300.
- Dec. 13, 1982, North Yemen, 6.0, 2,800.
- Nov. 23, 1980, Italy, 7.2, 4,800.
- Oct. 10, 1980, Algeria, 7.3, 4,500.
- May 6, 1976, Italy, 6.5, 946.
- Sept. 6, 1975, Turkey, 6.8, 2,312.
- Dec. 28, 1974, Pakistan, 6.3, 5,200.
- Dec. 23, 1972, Nicaragua, 6.2, 5,000.
- April 10, 1972, Iran, 6.9, 5,057.
- Feb. 9, 1971, San Fernando, Calif., 6.4, at least 58.
- Aug. 19, 1966, Turkey, 6.9, 2,520.
- July 26, 1963, Yugoslavia, 6.0, 1,100.
- Sept. 1, 1962, Iran, 7.1, 12,230.
- Feb. 29, 1960, Morocco, 5.8, 12,000.
- Dec. 13, 1957, Iran, 7.1, 2,000.
- March 18, 1953, Turkey, 7.2, 1,200.
- Aug. 22, 1952, Bakersfield, Calif. 5.8, two.
- Aug. 5, 1949, Ecuador, 6.8, 6,000.
- June 28, 1948, Japan, 7.3, 5,131.
- May 18, 1940, El Centro, Calif., 7.1, nine.
- March 10, 1933, Long Beach, Calif., 6.3, 115.
- June 29, 1925, Santa Barbara, Calif., 6.3, at least 12.
- Oct. 21, 1868, Hayward, Calif., 6.8, 30.
- Dec. 8 and 21, 1812, San Juan Capistrano, Calif., 7.0, at least 50.

jured hundreds.

Hall said the state and Los Angeles "didn't get serious about building codes until after the 1971 San Fernando earthquake," with a magnitude of 6.4, killed about 60 and injured 2,000.

If building codes are so great, why did the 1989 weaker, magnitude-7.1 Loma Prieta quake kill 63 people and injure 3,757 in the San Francisco Bay region?

The Landers quake was cen-

tered farther from the densest population areas. But the main reason for the higher toll in 1989 was that most deaths happened in a few vulnerable areas.

Oakland's Interstate-880 freeway collapse and the destruction of homes in San Francisco's Marina district happened on soft, bay-side fill that shook like gelatin. And some people were crushed when unreinforced buildings collapsed in Santa Cruz.