

How will California's freeways survive a major earthquake?

Dana Bartholomew, Los Angeles Daily News, 3-17-16

The 1971 Sylmar earthquake sent a 6.6-magnitude jolt through the Newhall Pass, toppling a new interchange at Interstate 5 and Highway 14 and two nearby freeway overpasses, killing two.

The 1994 Northridge earthquake sent an even stronger tremor through the San Fernando Valley, once again demolishing the "5-14 split." LAPD Officer Clarence Wayne Dean, whose police motorcycle sailed off a freeway precipice, was killed.

Since then, the state has spent billions shoring up freeway bridges and overpasses. Nonetheless, Southern California's maze of freeways, roads and railroads could still be impacted in the next major quake.

"We've certainly learned a lot since previous earthquakes, and have worked hard to bring bridges owned by the state to the latest seismic standards," said Vanessa Wiseman, a spokeswoman for the state Department of Transportation, or Caltrans. "They are safer as a result.

"But we keep getting more information about more earthquake faults, and what's new, and what's more active. It's important to design something that, in a strong enough earthquake, won't be damaged."

Earthquakes to shake the Southland over the last half century have not been kind to its transportation network, halting the delivery of goods and services, hampering employees trying to get to work, and dampening the overall economy.

The Sylmar earthquake knocked down three major freeway overpasses and severely damaged 42 bridges, littering freeways with debris, according to studies afterward.

The Northridge earthquake, at a stronger 6.7 magnitude, shattered more freeway overpasses on the Golden State, Antelope Valley, Simi Valley and Santa Monica freeways, in addition to miles of local roads and bridges, crippling commutes for millions.

The quake also derailed a 64-car freight train between Northridge and Chatsworth, which leaked toxic sulphuric acid. Local airports, including Los Angeles International, halted traffic for two hours as a safety precaution.

Recovery from those quakes took from months to years, with the need for safer roads and transit systems evolving out of decades of earthquake damage and research.

To protect highways — and lives — during future temblors, Caltrans has spent billions on seismic retrofits of state roads and bridges, with millions more granted for city and county roadway fixes.

After Sylmar, the state focused on upgrading its freeway bridge expansion joints. The deadly 6.9-magnitude 1989 Loma Prieta earthquake in Northern California prompted another massive renovation program.

Older overpasses, with rigid joints and columns, are being retrofitted to flex in order to stand up to a quake.

To keep them from collapsing like the failed Newhall Pass interchanges, the bridges and overpasses are being strengthened with steel cable and spiral column supports, with enlarged footings and deep pilings in soft soil.

“It’s important to design something that, in a strong enough earthquake, will bend instead of break,” Wiseman said. “We have folks around the world who turn to our seismic engineers for advice.”

The U.S. Geological Survey eight years ago predicted a near-certain likelihood of a major earthquake in California during the next 30 years.

For the Los Angeles region, the likelihood of another magnitude 6.7 earthquake like Northridge was 67 percent; for Southern California, 97 percent.

In the event of a much stronger quake, the agency modeled a “ShakeOut Scenario” of a magnitude 7.8 earthquake on the southern San Andreas Fault east of Palm Springs in tandem with the world’s largest earthquake drill.

The earthquake would rip for three minutes across Southern California, sparking 1,600 fires, damaging 300,000 buildings and causing \$213 billion in economic losses. When the dust eventually settled, nearly 2,000 residents would lay dead, while 50,000 would suffer serious injuries.

The midmorning quake would race at 2 miles a second through the Inland Empire, severing Interstate 15 at the Cajon Pass, while bending rail lines, derailing a train and sending landslides across rails and roads.

But the state highway system would fare well, according to the model quake. A \$6 billion investment in seismic retrofitting would pay off, with the only highway deaths being crashes caused by intense earthquake shaking.

But the Big One would take a tremendous toll on city and county bridges and overpasses, according to the USGS forecast, where seismic retrofitting was not completed, or yet begun.