



This corner panel was the most severely damaged, yet was salvaged by epoxy injection.

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## Crack Injection Saves 25 Concrete Wall Panels in Quake-Hit Building

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The earthquake that ripped through the San Fernando Valley at 6:00 a.m. was estimated to have caused over \$600 million damage. The epicenter was in the San Gabriel Mountains about 26 miles north of the City of Los Angeles. Heavy damage was concentrated in the Sylmar-San Fernando-Granada Hills area, in the north portion of the San Fernando Valley.

In the Sylmar area alone, Los Angeles building inspectors reported over 2000 commercial, industrial and residential buildings with major structural damage.

One of the severely hit buildings in Sylmar was the 41,000-sq. ft. manufacturing facility of Vector Electronic Company, Inc. located at 12460 Gladstone Ave. The structure is a reinforced concrete precast tilt-up wall panel building with poured concrete columns between the panels. There are 40 panels, each about 20 ft. sq. and from 6 to 8 in. thick, the thicker panels at the front of the building.

When the earthquake struck, there was severe ground movement in the Sylmar area. Geologists have since found evidence of tectonic faulting and ground surface breakage that undoubtedly contributed to the damage to the Vector structure. Measurements made after the earthquake indicate the structure has "grown" by about 6 inches in the north-south direction.

The building's roof system consisted of 1/2 in. thick plywood panelized and supported on glulam girders. Building damage generally can be attributed to failure of the plywood roof diaphragm. In most cases, this failure was at the exterior walls and consisted of nails either pulling out of the ledgers which were bolted to the panels or pulling out of the edge of the plywood sheets. In some cases, the ledgers split along the upper row of bolts. Some diaphragm failures also occurred away from the outside walls.

Some glulam beams and purlins pulled away from their seats or pulled the seats from the tops of the columns. Several bays of roof collapsed. Two panels at the front of the building fell out completely.

When the diaphragms failed, the panels and columns were required to cantilever vertically from the footings. This caused extensive cracking in the columns and panels horizontally near the ground line. Twenty-five panels were damaged by cracking, some of the cracks branching diagonally across the face. Three panels including the two that fell, had to be replaced. Only 12 were undamaged.

Some of the cracks probably were due to normal shrinkage stresses prior to the disaster. At any rate, after the earthquake there were over 1800 lin. ft. of hairline to 1/4 in. wide cracks in the 25 damaged panels.

### P. R. McQuade of Vector:

*Vector executive vice president and general manager.*

"Despite the earthquake's devastation of the Vector building in Sylmar, the company was back in production a few days later. We will continue to manufacture our line of products here and meet the needs of our customers with the confidence that the original building has been not only completely rebuilt, but also substantially strengthened to withstand future earthquakes and afford greater protection to our employees. We are sparing no expense to repair our 41,000-sq. ft. facility in the shortest time possible. Toward that goal we are cooperating to the fullest extent with the Los Angeles Department of Building & Safety, and the various contractors involved."



(Left). Cores for testing were taken by National Concrete Sawing Company in one panel at locations marked by the structural engineer. (Right). One of the cores, showing how the injected epoxy adhesive penetrated the cracks in the reinforced concrete of the tilt-up panel.